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PROGRAMMATIC INITIAL ENVIRONMENTAL EXAMINATION

PROJECT/ACTIVITY DATA

Project/Activity Name:	Partnerships for Enhanced Engagement in Research (PEER) Cycle 9 Programmatic Initial Environmental Examination (PIEE)
Geographic Location(s) (Country/Region):	Varies by Project
Amendment (Yes/No), if Yes indicate # (1, 2...):	No
Implementation Start/End Date (FY or M/D/Y):	FY 2021- FY2024
If Amended, specify New End Date:	
Solicitation/Contract/Award Number(s):	Various
Implementing Partner(s):	Partnerships for Enhanced Engagement in Research (PEER)
Bureau Tracking ID:	DDI-21-13
Tracking ID of Related RCE/IEE (if any):	PEER FY14-FY19 PIEE, PEER PIEE
Tracking ID of Other, Related Analyses:	

ORGANIZATIONAL/ADMINISTRATIVE DATA

Implementing Operating Unit(s): (e.g., Mission or Bureau or Office)	DDI/ITR/R
Other Affected Operating Unit(s):	
Lead BEO Bureau:	DDI
Funding Account(s) (if available):	
Original Funding Amount:	Between \$54,000 and \$300,000
If Amended, specify funding amount:	
If Amended, specify new funding total:	
Prepared by:	Environmental Compliance Support (ECOS) Contract
Date Prepared:	January 2020

ENVIRONMENTAL COMPLIANCE REVIEW DATA

Analysis Type:	<input checked="" type="checkbox"/> Environmental Examination	<input type="checkbox"/> Deferral
Environmental Determination(s):	<input checked="" type="checkbox"/> Categorical Exclusion(s) <input checked="" type="checkbox"/> Negative <input type="checkbox"/> Positive <input type="checkbox"/> Deferred (per 22 CFR 216.3(a)(7)(iv))	
IEE Expiration Date (if applicable):	Three years from signing of the 22 CFR 216 documentation or any change to project design or implementation	
Additional Analyses/Reporting Required:	EMMPs and EMMRs	
Climate Risks Identified (#):	Low 68	Moderate 36 High 2

Climate Risks Addressed (#):	Low <u>6</u>	Moderate <u>15</u>	High <u>2</u>
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THRESHOLD DETERMINATION AND SUMMARY OF FINDINGS

PROJECT/ACTIVITY SUMMARY

The Partnerships for Enhanced Engagement in Research (PEER) program is an international competitive grants program that funds scientists and engineers in developing countries who partner with U.S. government-funded researchers to address global development challenges. Areas of research include agriculture, biodiversity, disaster mitigation, education, energy, food security, infectious diseases, nutrition, maternal and child health and water.¹

This Programmatic IEE (PIEE) covers 28 PEER awards (referred to in this document as “Projects”) funded in PEER Cycle 9. These projects are described further in Section 1.2. Existing PEER projects must continue to follow their existing IEEs. Future PEER cycle projects will require an amendment to this PIEE.

ENVIRONMENTAL DETERMINATIONS

Upon approval of this document, the determinations become affirmed, per Agency regulations (22 CFR 216).

TABLE 1: ENVIRONMENTAL DETERMINATIONS

Projects/Activities	Categorical Exclusion Citation (if applicable)	Negative Determination	Positive Determination ²	Deferral ³
Project 1: Developing a framework for the identification of soil limiting factors for bioremediation of dioxin compounds in contaminated soils of Vietnam		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 2: Biochar Facilitated Bioremediation: A Green Solution for Dioxin/Furan Pollution		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 3: Nanoassisted bioremediation of diffused dioxins in soil and sediment		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 4: Community and Hospital-based Obstetrics WhatsApp Triage, Referral, and Transfer (WAT-RT) System		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 5: Bridging Higher Education and Practice: Addressing Gender Inequity in STEM and Sanitation in Malawi	216.2(c)(2)(i) 216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 6: Livelihood Change in the Context of Community	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

¹ Information from [PEER Factsheet](#)

² Positive Determinations require preparation of a Scoping Statement and Environmental Assessment.

³ Deferrals must be cleared through an Amendment to this IEE prior to implementation of any deferred activities.

Conservation				
Project 7: The evaluation of challenges of youth in Kazakhstan and piloting innovative solutions	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 8: Morogoro Youth Empowerment through Establishment of Social Innovation (YEESI) Lab for Problem-centered Training in Machine Vision	216.2(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 9: Long-term impacts of land-use/land-cover dynamics on surface water quality in Botswana's reservoirs using satellite data and artificial intelligence methods: case study of the Botswana's Limpopo River Basin		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 10: Engaging the private sector in increasing voluntary use of long-acting reversible contraceptives and permanent family planning methods in rural areas of Bangladesh		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 11: Young Wives: An Exploratory Study of Married Women Below Twenty and the Socio-Cultural Determinants of their Contraceptive Behavior in Low Resource Settings in India	216.2(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 12: Assessment and Comparison of Recovery of Biodiversity and Carbon Sequestration in Philippine Mangroves Among Natural, Replanted and Naturally recolonized Mangrove Stands		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 13: Assessment of the resilience of Local Baladi goats in Lebanon: a viable sustainable solution to a changing climate in a transhumant system		<input checked="" type="checkbox"/> <i>without</i> conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 14: 'Biodiversity correlates of sustainable value chain expansion in the Brazilian Amazon: Developing combined environmental DNA (eDNA) and camera trapping protocols to assess vertebrate diversity in managed Brazil nut forests.		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 15: Inclusive Economic Growth for Sustainable Peace? Assessing Development Mechanisms and Conservation Efforts in Post-Conflict Colombia	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 16: Assessment of Geothermal Energy Resources and		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>

Natural Hazards In Armenia				
Project 17: Improving human livelihoods through holistic conservation of Malagasy orphaned plants, the iconic Baobab trees		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 18: Multi-Scale, Interdisciplinary Integrated Analysis of Societal and Ecosystem Values of Peruvian Amazon Peatlands		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 19: Creating knowledge on cocoa pollinators in agroforestry systems of the Dominican Republic for improving plantation management practices		<input checked="" type="checkbox"/> With conditions.	<input type="checkbox"/>	<input type="checkbox"/>
Project 20: Phytochemical, biological and toxicological evaluation of hop (<i>Humulus lupulus</i> L.) from populations growing wild in Kosovo		<input checked="" type="checkbox"/> With conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 21: Solar dryer integrated with energy storage system: An energy efficient and environmentally friendly technology for drying biomaterials in Tanzania		<input checked="" type="checkbox"/> With conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 22: Improving sustainability and resilience of Peruvian Amazon systems through silvopastoralism		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 23: Agrivoltaic Technology in Drylands of West Africa: Strengthening National Innovation Systems for Diffusion and Market Development at the Water-Energy-Food Nexus		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 24: Climate mitigation potential of Colombia's lowland peatlands: distribution, emission factors and conservation priorities		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 25: Enhancing capacity of local communities in Laikipia County, Kenya: increasing preparedness and response to emerging infectious diseases in parallel with preservation of biodiversity	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 26: The Effects of Excessive Water Use and Agricultural Intensification on Aral Sea Shrinkage: SES Dynamics within the Syr Darya River Basin		<input checked="" type="checkbox"/> With conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 27: Renewable Hydrogen Generation with Carbon Recycling (ReHyCaRe) from Biogenic Residues of Bangladesh		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 28: Water Harvesting at		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Community Level for Enhanced Access to Ground Water		with conditions		
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CLIMATE RISK MANAGEMENT

Climate Risk Management (CRM) screen was conducted in consideration of the potential effect of climate risks/stressors on the sustainability of the project (changing precipitation patterns, rising temperature, floods, droughts, fires, landslides, etc.) in addition to the impact of project activities on the climate (increased greenhouse gas emissions, land use changes, etc.). See Annex 1 for the complete CRM table.

BEO SPECIFIED CONDITIONS OF APPROVAL

IMPLEMENTATION

In accordance with 22 CFR 216 and Agency policy, the conditions and requirements of this document become mandatory upon approval. This includes the relevant limitations, conditions and requirements in this document as stated in Sections 3, 4, and 5 of the IEE and any BEO Specified Conditions of Approval.

USAID APPROVAL OF INITIAL ENVIRONMENTAL EXAMINATION

PROJECT/ACTIVITY NAME: Partnerships for Enhanced Engagement in Research (PEER) Cycle 9
Programmatic Initial Environmental Examination (PIEE)

Bureau Tracking ID: DDI-21-13

Approval:	<u><i>Ticora V. Jones</i></u> Ticora V. Jones, Acting ITR Hub Director	<u>7.13.21</u> Date
Clearance:	<u><i>Andrew Gerard</i></u> Andrew Gerard, PEER Team Lead	<u>7/13/21</u> Date
Clearance:	<u><i>Aaron Burr</i></u> Aaron Burr, A/COR	<u>7/12/21</u> Date
Clearance:	<u><i>Teresa Bernhard</i></u> Teresa Bernhard, DDI Climate Integration Lead	<u>8/2/2021</u> Date
Concurrence:	<u><i>Teresa Bernhard</i></u> Teresa Bernhard, DDI acting Bureau Environmental Officer	<u>8/2/2021</u> Date

DISTRIBUTION:

PROGRAMMATIC INITIAL ENVIRONMENTAL EXAMINATION

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1.0 PROJECT/ACTIVITY DESCRIPTION

1.1 PURPOSE OF THE PIEE

The purpose of this document, in accordance with Title 22, Code of Federal Regulations, Part 216 ([22 CFR 216](#)), is to provide a preliminary review of the reasonably foreseeable effects on the environment of the USAID intervention described herein and recommend determinations and, as appropriate, conditions, for these activities. Upon approval, these determinations become affirmed, and specified conditions become mandatory obligations of implementation. This PIEE also documents the results of the Climate Risk Management process in accordance with USAID policy (specifically, [ADS 201mal](#)).

This PIEE is a critical element of USAID's mandatory environmental review and compliance process meant to achieve environmentally sound design and implementation. Potential environmental impacts should be addressed through formal environmental mitigation and monitoring plans (EMMPs) and/or Environmental Assessments (EAs), if needed.

This PIEE covers 28 PEER awards (referred to in this document as "Projects") funded in PEER Cycle 9. These programs are briefly described in Section 1.3 below.

Existing PEER projects must continue to follow their existing IEEs.

1.2 PROJECT/ACTIVITY OVERVIEW

The Partnerships for Enhanced Engagement in Research (PEER) program is an international competitive grants program that funds scientists and engineers in developing countries who partner with U.S. government-funded researchers to address global development challenges. The PEER program directly supports scientists in USAID-presence countries through institutional research awards ranging up to \$300,000. Since its launch in 2011, PEER has awarded more than \$66 million to almost 370 projects in 57 countries. The goal of PEER is to help build capacity among local scientists and research institutions, strengthen research partnerships world-wide, and better translate data and evidence into policy. Areas of research include agriculture, biodiversity, disaster mitigation, education, energy, food security, infectious diseases, nutrition, maternal and child health and water.⁴

1.3 PROJECT DESCRIPTIONS

Project 1: Developing a framework for the identification of soil limiting factors for bioremediation of dioxin compounds in contaminated soils of Vietnam. This project seeks to develop a framework for the identification of soil limiting factors in order to enhance the biodegradation of dioxin compounds in contaminated sites in Vietnam for the bioremediation process through an innovative and integrated approach to overcome limiting factors of soil and bioavailability of dioxin compounds in the soil. The project will transfer site-specific bio-remediation strategies to local stakeholders.

Project 2: Biochar Facilitated Bioremediation: A Green Solution for Dioxin/Furan Pollution. The goal of this project is to address the problem of Agent Orange contaminated soils in Vietnam through a green, circular economy solution issuing plant-based biochars to mediate the bioremediation of PCDD/Fs. This will be achieved through a three-phase research project focusing on the biochar-stimulated bioremediation of PCDD/Fs in Agent Orange contaminated soil.

⁴ Information from [PEER Factsheet](#)

Project 3: Nanoassisted bioremediation of diffused dioxins in soil and sediment. The overall goal of this project is to develop suitable nano-assisted bioremediation technologies to remove dioxins at diffused levels from the contaminated soils/sediments at hotspot airbases in Vietnam. This will involve an investigation of microbial communities enriched from indigenous seeding in local contaminated sites, an assessment of the treatment efficiency of the laboratory experiments for the actual soils/sediments collected from the air base, a pilot-scale sequential biological treatment at the air base, the design of full-scale treatment units to remove dioxins from contaminated soils and the dissemination of results.

Project 4: Community and Hospital-based Obstetrics WhatsApp Triage, Referral, and Transfer (WAT-RT) System. This project aims to increase continuity and access to quality maternal care reducing preventable, obstetric-related deaths through: 1) a WhatsApp Triage, Referral and Transfer (WAT-RT) System connecting community health workers (CHWs), midwives at rural health facilities, and healthcare personnel at referral hospitals, and 2) an obstetric (OB) triage system implemented at referral hospitals to decrease facility delays.

Project 5: Bridging Higher Education and Practice: Addressing Gender Inequity in STEM and Sanitation in Malawi. This project aims to develop a Sanitation-STEM Education and Innovation Process (SSEIP) Model and well as to improve the curricula at Malawian institutes of higher education. To achieve these aims, this project will be implemented through Work Packages (WPs) based to produce these deliverables.

Project 6: Livelihood Change in the Context of Community Conservation. The objective of this study is to measure change in reliance on natural resources, and a subsequent shift in the composition of the livelihood capital basket for rural households. From this, the study will assess the extent to which adaptive capacity varies from household to household based on livelihood strategies, and how adaptive capacity generally has changed over time in the study area communities.

Project 7: The evaluation of challenges of youth in Kazakhstan and piloting innovative solutions. The project aims to reduce the level of NEET youth (i.e., those who are Not in Employment, Education or Training) by increasing the effectiveness of prevention, coverage, and reintegration policies of the government of Kazakhstan.

Project 8: Morogoro Youth Empowerment through Establishment of Social Innovation (YEESI) Lab for Problem-centered Training in Machine Vision. The proposed project aims at establishing a machine vision innovation lab that will be used for training youth in the Morogoro region on machine vision using a problem-centered training approach. The problem-centered training is done by using four conventional methods: problem-based learning, experiential-based learning, research-based learning, and project-based learning. The youth will be trained using the mentioned teaching methods (pedagogical) for active teaching and learning. It provides a student-centered approach in which a real-life open and complex problem is presented to a group of students for a quick collaborative understanding of it and provides innovative solutions.

Project 9: Long-term impacts of land-use/land-cover (LULC) dynamics on surface water quality in Botswana's reservoirs using satellite data and artificial intelligence methods: case study of Botswana's Limpopo River Basin (LRB). The aim of this study is to understand the long-term (1984-2019) impacts of LULC changes on reservoir water quality within Botswana's LRB in order to establish the land-water nexus within the basin, and to

determine the linkages and pathways of the influences of the factors of socio-economic development and climate change on water quality within the basin.

Project 10: Engaging the private sector in increasing voluntary use of long-acting reversible contraceptives and permanent family planning methods in rural areas of Bangladesh. The overall aim of the research is to reduce unmet need for family planning and increase use of effective contraception among post-partum women in rural Bangladesh through engaging the private sector. The specific objectives of the study are to: (1) develop and test a mechanism to engage private clinics at Upazila (sub-district) level in order to improve postpartum family planning services, and (2) increase access to long-acting reversible contraceptives and permanent methods during the postpartum period among women who gave birth.

Project 11: Young Wives: An Exploratory Study of Married Women Below Twenty and the Socio-Cultural Determinants of their Contraceptive Behavior in Low Resource Settings in India. This research project aims to study the socio-cultural norms including gender roles that determine the family planning (FP) behaviors of young couples and their decisions related to childbearing. It will generate evidence required to design replicable and scalable FP interventions for shifting these norms in favor of delaying the first pregnancy among such couples in Jharkhand and Assam, known for high incidence of early marriage and conception. This study focuses on research that can inform the design of interventions to delay the first pregnancy among young wives.

Project 12: Assessment and Comparison of Recovery of Biodiversity and Carbon Sequestration in Philippine Mangroves Among Natural, Replanted and Naturally-recolonized Mangrove Stands. This project will assess the recovery of selected ecosystem services in restored (planted and naturally recolonized) mangroves. Carbon (C) sequestration, C stocks, C burial, and biodiversity will be compared across different aged, restored stands (planted and naturally recolonized) and intact, natural mangroves within similar geographical seascapes.

Project 13: Assessment of the resilience of Local Baladi goats in Lebanon: a viable sustainable solution to a changing climate in a transhumant system. The objectives of this project are to assess parasite prevalence and impact on the Baladi goat industry, as well as to develop a support strategy for local farmers in order to ensure sustainability of the existing production system, be it via a more productive and resilient animal or a better contribution of women in the artisanal by-product processing industry.

Project 14: Biodiversity correlates of sustainable value chain expansion in the Brazilian Amazon: Developing combined environmental DNA (eDNA) and camera trapping protocols to assess vertebrate diversity in managed Brazil nut forests. This project combines camera trapping, transect-based surveys, and environmental DNA (eDNA) and invertebrate-derived DNA (iDNA) samples to assess the influence of commercial Brazil nut harvests on terrestrial vertebrate diversity in native Amazonian forests.

Project 15: Inclusive Economic Growth for Sustainable Peace? Assessing Development Mechanisms and Conservation Efforts in Post-Conflict Colombia. There are three main objectives with this project. The first objective is to understand the conditions for enduring peace by identifying the characteristics associated with inclusive, rural development, reduced violence, and social wellbeing, especially for vulnerable populations including Afro-Colombians, indigenous populations, and women. The second objective is to contribute to policymaking by

assessing the effects that development programs have on the environment, since environmental sustainability is a tenet of long-lasting peace and inclusive development. The third objective is to engage stakeholders through a policy brief and an impact event to share how our research might shape practices and policies around efforts to bring about peace through development.

Project 16: Assessment of Geothermal Energy Resources and Natural Hazards in Armenia. The goal of the proposed project is to strengthen scientific partnership and cooperation between the U.S. and Armenia in the field of Earth sciences, by building an interdisciplinary team to address important issues of sustainable development such as geothermal energy, natural hazards, and risks.

Project 17: Improving human livelihoods through holistic conservation of Malagasy orphaned plants, the iconic Baobab trees. This project will investigate the mechanisms ensuring the persistence of Malagasy baobab tree, an orphaned plant in Madagascar's dry forests and to advance nature-based solutions through promoting both human livelihoods and biodiversity conservation. It will specifically focus on the investigation study of the seed dispersal process of *Adansonia grandidieri*, an economically valuable orphaned plant in the Western part of Madagascar.

Project 18: Multi-Scale, Interdisciplinary Integrated Analysis of Societal and Ecosystem Values of Peruvian Amazon Peatlands. The project aims to co-create new knowledge on the distribution of peatlands, their carbon storage, and how local people understand, use and steward these ecosystems through interdisciplinary methods including ecosystem inventories, remote sensing, and qualitative and quantitative social science.

Project 19: Creating knowledge on cocoa pollinators in agroforestry systems of the Dominican Republic for improving plantation management practices. The main objective of the project is to understand how both the composition and the efficiency of cocoa pollinators' communities are affected at plot level by farmers' practices and surrounding land uses.

Project 20: Phytochemical, biological and toxicological evaluation of hop (*Humulus lupulus* L.) from populations growing wild in Kosovo. The goal of this study is to evaluate the molecular genetic and chemical variability of the Kosovan wild hop germplasm. This will involve the evaluation of the genetic variability of wild hops using PCR and DNA analyses, an analysis of the chemical composition and variability of the hops, and an assessment of the biological activity of plant extracts and their fractions.

Project 21: Solar dryer integrated with energy storage system: An energy efficient and environmentally friendly technology for drying biomaterials in Tanzania. The primary objective of this study is to develop an inexpensive, effective, reliable, and environmentally benign drying technology in Tanzania.

Project 22: Improving sustainability and resilience of Peruvian Amazon systems through silvopastoralism. The aim of the proposed project is to increase sustainability and resilience of Peruvian Amazon livestock systems through silvopastoralism by assessing sustainability and resilience of silvopastoral systems (SPS) compared with conventional pasture-based systems CPS and estimating C storage potential of SPS compared with CPS.

Project 23: Agrivoltaic Technology in Drylands of West Africa: Strengthening National Innovation Systems for Diffusion and Market Development at the Water-Energy-Food

Nexus. The project aims to develop an agrivoltaic system to bolster national resilience of renewable energy and food production security to a changing climate in Ghana.

Project 24: Climate mitigation potential of Colombia's lowland peatlands: distribution, emission factors and conservation priorities. The overarching goal of this project is to provide a roadmap of peatland-driven climate mitigation under different land use and deforestation scenarios in the Colombian Amazon.

Project 25: Enhancing capacity of local communities in Laikipia County, Kenya: increasing preparedness and response to emerging infectious diseases in parallel with preservation of biodiversity. The project seeks to equip pastoral communities in Laikipia County, Kenya by educating them on local environmental influences on Emerging Infectious Diseases (EIDs).

Project 26: The Effects of Excessive Water Use and Agricultural Intensification on Aral Sea Shrinkage: Socioeconomic-Environmental Systems Dynamics within the Syr Darya River Basin. This project will aim to build a comprehensive database and knowledge to understand physical and socio-economic changes, as well as their forcing and consequences on the ecosystems and societies within the Syr Darya River basin (SDRB).

Project 27: Renewable Hydrogen Generation with Carbon Recycling (ReHyCaRe) from Biogenic Residues of Bangladesh. This project will explore the biogenic residues available in Bangladesh by anaerobic digestion (AD) to produce biogas, which will be cleaned and further upgraded to H₂ with low-cost catalyst. From this study, it will be possible to make policy suggestions to direct the deployment of highly efficient energy systems, laying the foundation for an H₂-based clean energy infrastructure.

Project 28: Water Harvesting at Community Level for Enhanced Access to Groundwater. The main objective of this study is to assess sustainable rainwater harvesting techniques and identify suitable areas for water harvesting through irrigation canals, spring flow in non-consuming seasons, and pond flooding potential to increase the level of groundwater for water supplying purposes.

TABLE 2: DEFINED OR ILLUSTRATIVE PROJECTS AND SUB-ACTIVITIES

Project 1 — Developing a framework for the identification of soil limiting factors for bioremediation of dioxin compounds in contaminated soils of Vietnam
Sub-activity 1.1: Survey (21 soil samples) of residual concentration of aged dioxin compound in air base soils
Sub-activity 1.2: Soil property analysis
Sub-activity 1.3: Isolation and screening of biosurfactant producing bacteria
Sub-activity 1.4: Isolation and characterization of dibenzofuran (DF) degrading bacteria
Sub-activity 1.5: Bioremediation experiments in microcosms (lab)
Sub-activity 1.6: Testing lab bioremediation treatments at field sites
Sub-activity 1.7: Continued sampling/testing for results
Project 2 — Biochar Facilitated Bioremediation: A Green Solution for Dioxin/Furan Pollution
Sub-activity 2.1: Obtain and prep biochar feedstocks
Sub-activity 2.2: Elemental analysis of biochars and feedstocks
Sub-activity 2.3: Soil Samples from test site – containing agent orange3.
Sub-activity 2.4: Testing sorptive capacity of biochars
Sub-activity 2.5: Analysis of sorptive removal capacity of biochars
Sub-activity 2.6: Development of online courses and videos on bioremediation, environmental

microbiology, and environmental chemistry to build capacity of students.

Project 3 — Nano-assisted bioremediation of diffused dioxins in soil and sediment

Sub-activity 3.1: Samples and enrichment

Sub-activity 3.2: Lab experiments using anaerobic and aerobic digestion

Sub-activity 3.3: Pilot scale onsite treatment using best results from experiment

Sub-activity 3.4: Design of full-scale treatment

Sub-activity 3.5: Disseminate results and provide capacity building for local partners.

Project 4 — Community and Hospital-based Obstetrics WhatsApp Triage, Referral, and Transfer (WAT-RT) System

Sub-activity 4.1: Participatory action research to identify health system challenges and learning needs assessment of WhatsApp

Sub-activity 4.2: Protocol design for WAT-RT

Sub-activity 4.3: Training of trainers on implementation of WAT-RT system at 40 clinics and 2 hospitals

Sub-activity 4.4: Assessment of current OB triage protocols

Sub-activity 4.5: Interactive triage training for emergency and labor & delivery personnel at hospitals

Sub-activity 4.6: Monitoring and Evaluation

Project 5 — Bridging Higher Education and Practice: Addressing Gender Inequity in STEM and Sanitation in Malawi

Sub-activity 5.1: Gender inequity research in sanitation and STEM

Sub-activity 5.2: Curriculum development and training materials to address gender inequity gaps

Project 6 — Livelihood Change in the Context of Community Conservation

Sub-activity 6.1: Database alignment of 2 existing data sets

Sub-activity 6.2: Development of compound variables and indices to represent different types of capital

Sub-activity 6.3: Statistical modeling

Sub-activity 6.4: Development of adaptive capacity index

Sub-activity 6.5: Analysis write-up

Sub-activity 6.6: Report back to communities

Project 7 — The evaluation of challenges of youth in Kazakhstan and piloting innovative solutions

Sub-activity 7.1: Desk studies on existing evidence on youth NEET (not in employment, education, or training) interventions

Sub-activity 7.2: Determine NEET youth profile in Kazakhstan through qualitative studies/surveys

Sub-activity 7.3: Research capacity activities to improve the understanding of lab and field experimental methods; training of research members in experimental evaluation methods

Sub-activity 7.4: Implementation of lab and field experiments in Kazakhstan - focused on youth attitudes and trust in institutions and government, as well as behavioral intervention based on youth attitudes

Sub-activity 7.5: Policy recommendations, capacity building, and reporting.

Project 8 — Morogoro Youth Empowerment through Establishment of Social Innovation (YEESI) Lab for Problem-centered Training in Machine Vision

Sub-activity 8.1: Develop a problem-centered learning and project-centered learning curriculum for Machine vision for novice and advanced software developers.

Sub-activity 8.2: Develop a program to be hosted under ITCB to train Morogoro Youth to solve Machine vision problems.

Sub-activity 8.3: Develop hackathons, local competitions to solve agricultural problems using Machine vision.

Sub-activity 8.4: Develop an awareness program to engage universities in Morogoro on Machine Vision and its applications in agriculture.

Sub-activity 8.5: Establish social innovation lab (YEESI) to provide consultancy services.

Project 9 — Long-term impacts of land-use/land-cover dynamics on surface water quality in Botswana's reservoirs using satellite data and artificial intelligence methods: case study of the Botswana's Limpopo River Basin

Sub-activity 9.1: Mapping and quantifying the spatio-temporal land-use and land-cover (LULC) patterns in the Limpopo River Basin (LRB) from 1984-2019 to create a forecasting model.

Sub-activity 9.2: Quantify and analyze the correlation between water availability and the determinant water quality parameters in LRB.

Sub-activity 9.3: Develop and compare different machine-learning AI models for the simulation and prediction of the trend impacts of LULU change on water quality and water availability.

Sub-activity 9.4: Determine the significant water quality parameters in the reservoir water bodies and develop empirical models from the in site measurements and spectral reflectance analyses using UAV-borne spectrometer observations combined with satellite data for near-real-time estimation of reservoirs' water quality.

Sub-activity 9.5: Derive an empirical framework that interlinks and accounts for the interactions and relations between the land and water systems, and their inter-linkages with socio-economic development and climate change with potential impacts on rural and urban communities.

Project 10 — Engaging the private sector in increasing voluntary use of long-acting reversible contraceptives and permanent family planning methods in rural areas of Bangladesh

Sub-activity 10.1: Develop messages and leaflets on pregnancy care

Sub-activity 10.2: Rapid program readiness assessment of private intervention clinics

Sub-activity 10.3: Identify and prepare list of pregnant women in the study areas

Sub-activity 10.4: Development of simple mobile phone-based messaging system

Sub-activity 10.5: SMS messaging of identified pregnant women to promote institutional delivery and post-partum family planning (PP-FP) after delivery

Sub-activity 10.6: Counseling of pregnant women in private clinics

Sub-activity 10.7: Training on technical and ethical issues to private clinic staff involved in program services

Sub-activity 10.8: Trainees provision of delivery care and PP-FP services as per choice of the mothers

Sub-activity 10.9: Monitoring

Project 11 — Young Wives: An Exploratory Study of Married Women Below Twenty and the Socio-Cultural Determinants of their Contraceptive Behavior in Low Resource Settings in India

Sub-activity 11.1: Study the socio-cultural norms including gender roles that determine the family planning behaviors of young couples and their decisions related to childbearing

Sub-activity 11.2: Education and training for both quantitative and qualitative surveys

Sub-activity 11.3: Surveys and interviews to understand the prevailing socio-cultural norms around family planning

Sub-activity 11.4: Workshop

Sub-activity 11.5: Data sharing

Project 12 — Assessment and Comparison of Recovery of Biodiversity and Carbon Sequestration in Philippine Mangroves Among Natural, Replanted and Naturally-recolonized Mangrove Stands

Sub-activity 12.1: Establish and compare ecosystem services in conserved vs. restored mangroves

Sub-activity 12.2: Develop/train researchers in the assessment of C sequestration, C stocks, C burial, and biodiversity in conserved vs. restored mangroves

Sub-activity 12.3: Community engagement

Sub-activity 12.4: Develop policy briefs and programs for more effective mangrove restoration

Project 13 — Assessment of the resilience of Local Baladi goat in Lebanon: a viable sustainable solution to a changing climate in a transhumant system

Sub-activity 13.1: Literature Review for background data

Sub-activity 13.2: Climate Data collection

Sub-activity 13.3: Parasite Analysis through fecal samples

Sub-activity 13.4: Genotyping and GWAS analysis through blood samples

Sub-activity 13.5: Data analysis of milk production, kid growth, DOE BW, BCS and parasite prevalence

Sub-activity 13.6: Data sharing, capacity building and training

Project 14 — 'Biodiversity correlates of sustainable value chain expansion in the Brazilian Amazon: Developing combined environmental DNA (eDNA) and camera trapping protocols to assess vertebrate diversity in managed Brazil nut forests.

Sub-activity 14.1: Work with community to identify survey sites one inhabited, multiple-use protected area (Extractive Reserve), and one uninhabited, strict protection area (Ecological Station)

Sub-activity 14.2: Training of parabiologists from the local community
Sub-activity 14.3: Survey and describe the vertebrate fauna using camera trapping, transect-based surveys, and environmental DNA (eDNA), and invertebrate-derived DNA (iDNA) samples.
Sub-activity 14.4: Workshops and conferences
Sub-activity 14.5: Develop a research framework for the issue and stimulate a larger research program
Project 15 — Inclusive Economic Growth for Sustainable Peace? Assessing Development Mechanisms and Conservation Efforts in Post-Conflict Colombia
Sub-activity 15.1: Identifying the characteristics associated with inclusive, rural development, reduced violence, and social wellbeing, especially for vulnerable populations including Afro-Colombians, indigenous populations, and women
Sub-activity 15.2: Assessing the effects that development programs have on the environment
Sub-activity 15.3: Engage stakeholders to assess effects of development programs, share research, and shape practices and policies
Sub-activity 15.4: Disseminate findings
Project 16 — Assessment of Geothermal Energy Resources and Natural Hazards in Armenia
Sub-activity 16.1: Develop extended, volcanological, geophysical, geochemical and borehole GIS database to summarize all existing information associated with geothermal energy potential.
Sub-activity 16.2: Apply geochemical, volcanological, volcano-tectonic and geophysical research and application of innovative satellite methods to study promising areas for exploration of geothermal energy resources.
Sub-activity 16.3: Train volcanologists and seismologists to advance systematic studies of potential natural hazards and risks and geothermal resources by using new investigation approaches and methods.
Sub-activity 16.4: Develop recommendations regarding further exploration and use of geothermal energy resources.
Sub-activity 16.5: Collaborate on studies to improve knowledge of geological hazards and facilitate commercialization of research results.
Project 17 — Improving human livelihoods through holistic conservation of Malagasy orphaned plants, the iconic Baobab trees
Sub-activity 17.1: Fieldwork to investigate the extent animals interacting with baobab fruits
Sub-activity 17.2: Fieldwork to determine the role of extent animals in seed dispersal services of baobab trees
Sub-activity 17.3: Activities to develop nurseries, training and habitat restoration
Sub-activity 17.4: Activities to establish the baobab fruit trade for 90 households
Sub-activity 17.5: Activities to develop principles and recommendations to best practice of baobab sustainable exploitation & conservation
Project 18 — Multi-Scale, Interdisciplinary Integrated Analysis of Societal and Ecosystem Values of Peruvian Amazon Peatlands
Sub-activity 18.1: Build ground-validated high-resolution maps of peatland location and extent in the understudied area of the Ucayali river
Sub-activity 18.2: Carry out training workshops on social and ecological research in the city of Pucallpa
Sub-activity 18.3: Measure biomass stocks in trees and soils in areas where peatlands are not yet quantified
Sub-activity 18.4: Using participatory social science methods, co-develop a dynamic peatlands territorial-political map of local populations and their multi-scale socio-economic activities
Sub-activity 18.5: Compile socio-economic information from various sources including local municipalities, regional governments, the national government, international organizations, local accounts, and scholarly publications
Sub-activity 18.6: Co-create a repeatable social ecological 'nexus' research framework
Sub-activity 18.7: Integrate geographical distribution, ecological, and socioeconomic information into geographical information systems for public access
Project 19 — Creating knowledge on cocoa pollinators in agroforestry systems of the Dominican Republic for improving plantation management practices

Sub-activity 19.1: Landscape analysis to identify a gradient, from highly forested to not forested, regarding the ecosystems surrounding cocoa plantations in each region
Sub-activity 19.2: Characterization of cocoa farmers' practices from a sample of 90 cocoa farmers selected in three contrasted cocoa production areas along the landscape gradient
Sub-activity 19.3: Characterization of habitats for cocoa pollinator communities
Sub-activity 19.4: Identification of insect communities
Sub-activity 19.5: Assessment of pollination efficiency among taxa followed by pollination rate assessment in laboratory and pollination efficiency assessment in the field by monitoring cocoa pod development
Sub-activity 19.6: Evaluation of the trade-offs between farmer's practices and surrounding ecosystems
Sub-activity 19.7: Capacity building for local technicians, researchers, cocoa farmers, and their families
Project 20 — Phytochemical, biological and toxicological evaluation of hop (<i>Humulus lupulus</i> L.) from populations growing wild in Kosovo
Sub-activity 20.1: Review of the relevant literature and collection of plant materials
Sub-activity 20.2: DNA analyses of Hops collected from different wild populations.
Sub-activity 20.3: Extraction and analysis of volatile and non-volatile organic compounds
Sub-activity 20.4: Evaluation of plant extracts' toxicity
Sub-activity 20.5: Training, capacity building, and publications.
Project 21: Solar dryer integrated with energy storage system: An energy efficient and environmentally friendly technology for drying biomaterials in Tanzania
Sub-activity 21.1: Preparation and characterization of thermal energy-storage materials (rocks)
Sub-activity 21.2: Installation of a solar cabinet dryer prototype
Sub-activity 21.3: In-situ experimental and theoretical performance analysis of the developed dryer
Sub-activity 21.4: Quality assessment and chemical analysis of the dried products
Sub-activity 21.5: Economic evaluation of the developed system
Project 22 — Improving sustainability and resilience of Peruvian Amazon systems through silvopastoralism
Sub-activity 22.1: Perform a holistic assessment of sustainability and resilience of silvopastoral systems compared with conventional pasture-based systems
Sub-activity 22.2: Strengthen students' capacities in sustainability assessment and livestock production systems in tropical regions
Sub-activity 22.3: Recommend strategies for sustainable and resilient livestock production in the Amazon to stakeholders including producers, policy makers, and industry leaders
Sub-activity 22.4: Estimate carbon storage potential of silvopastoral systems compared with conventional pasture-based systems
Project 23 — Agrivoltaic Technology in Drylands of West Africa: Strengthening National Innovation Systems for Diffusion and Market Development at the Water-Energy-Food Nexus
Sub-activity 23.1: Design and construct pilot agrivoltaic systems with a solar-powered drip irrigation system for concurrent renewable energy and food production in two climatic zones of Ghana: tropical rainforests and tropical savanna
Sub-activity 23.2: Evaluate the potential impacts of the pilot systems for improved renewable energy generation, irrigation water management and food production
Sub-activity 23.3: Evaluate the potential socioeconomic and environmental impacts of the pilot system in selected districts of Ghana
Sub-activity 23.4: Disseminate the results and establish an appropriate transition arena of key stakeholders
Project 24 — Climate mitigation potential of Colombia's lowland peatlands: distribution, emission factors and conservation priorities
Sub-activity 24.1 Develop a high-resolution map of peatland distribution, peat depth, and carbon stocks of peatlands in the Colombian Amazon
Sub-activity 24.2 Ground-truthing to validate peatland map through peat sampling, observation, and analysis
Sub-activity 24.3 Quantify the main factors associated with changes in soil GHG emissions and peat accumulation rate from Amazonian peatlands under different disturbance regimes (forest degradation

and deforestation).

Sub-activity 24.4 Develop mapping and monitoring protocols that are compatible with the forest monitoring and the national inventory programs.

Sub-activity 24.5 Cross-training and building local analytical capabilities

Project 25 — Enhancing capacity of local communities in Laikipia County, Kenya: increasing preparedness and response to emerging infectious diseases in parallel with preservation of biodiversity

Sub-activity 25.1 Conduct a sociological study using questionnaires and observation studies to complement and further explore the cultural practices associated with Emerging Infectious Diseases (EIDs)

Sub-activity 25.2 Sensitize pastoral communities on EID presence and how to minimize risk through a series of workshops and development of training materials

Sub-activity 25.3 Demonstrate ecological importance of EID vectors and reservoirs to promote conservation and protection of species

Sub-activity 25.4 Surveying important areas for conservation of relevant species and developing methods to assess their numbers with community members

Sub-activity 25.5 Quantitative analysis of the behavioral questionnaire responses using R

Project 26 — The Effects of Excessive Water Use and Agricultural Intensification on Aral Sea Shrinkage: Socioeconomic-Environmental Systems Dynamics within the Syr Darya River Basin

Sub-activity 26.1: Construct a comprehensive database of climate, stream flows, agricultural lands, time series of land cover at 5-year intervals since 1973, economic measures, social indicators, and major policies for the three districts along the Syr Darya river, including sampling along transects.

Sub-activity 26.2: Explore the interdependent changes of food, energy, and water for the three districts with high-resolution data for mechanistic understanding of coupled changes between climate and land use.

Sub-activity 26.3: Identify critical drivers (including policy shifts) on stream flows and ET loss through data analysis and the installation of three World Meteorology Organization standard microclimatic stations.

Sub-activity 26.4: Develop an open-access webpage to share all data and research findings publicly

Sub-activity 26.5: Build capacity and knowledge to understand physical and socioeconomic changes

Project 27 — Renewable Hydrogen Generation with Carbon Recycling (ReHyCaRe) from Biogenic Residues of Bangladesh

Sub-activity 27.1 Lifecycle assessment of environmental impacts of biogas cleaning, catalytic dry reforming (CaDRe), and bio-slurry management

Sub-activity 27.2 Scoping study, feedstock characterization, and pre-treatment of feedstock.

Sub-activity 27.3 Bench-scale experimental activity with anaerobic co-digestion of biogenic residues, biogas cleaning, and catalytic reforming of biogas for H₂ production

Sub-activity 27.4 Techno-economic analysis of the integrated concept through building a process model

Sub-activity 27.5 Dissemination, management, reporting, capacity building, and progress meetings

Project 28 — Water Harvesting at Community Level for Enhanced Access to Ground Water

Sub-activity 28.1: Collection of primary data related to water quantity, quality, and harvesting

Sub-activity 28.2: Development of integrated modeling system to assess the effects of rainwater harvesting

Sub-activity 28.3: Drilling of piezometric wells and establishment of percolation ponds to determine aquifer properties, soil characteristics, and to monitor the recharge efficiency of rainwater harvesting on groundwater level

Sub-activity 28.4: Impact assessment of artificial recharge structures

Sub-activity 28.5: Raising awareness, training, and dissemination of information.

Will this project/activity involve construction⁵ as defined by ADS 201 and 303? Yes x No ☐

⁵ **Construction, as defined by ADS 201 and 303**, includes: construction, alteration, or repair (including dredging and excavation) of buildings, structures, or other real property and includes, without limitation, improvements, renovation, alteration and refurbishment. The term includes, without limitation, roads, power plants, buildings, bridges, water

While the PEER mechanism will not fund construction, it is possible that construction could occur as a connected action related to the interventions under each activity. Therefore, this document includes analysis and mitigation measures addressing this possibility. One PEER Cycle 9 project will involve installation of component parts that are dependent on construction activities to be performed by the PEER researcher and his university for the implementation of the PEER project. However, no funding from USAID or through the PEER mechanism will be used to perform the construction.

2.0 BASELINE ENVIRONMENTAL INFORMATION

2.1 LOCATIONS AFFECTED AND ENVIRONMENTAL CONTEXT (ENVIRONMENT, PHYSICAL, CLIMATE, SOCIAL, THREATENED AND ENDANGERED SPECIES)

Project 1: Developing a framework for the identification of soil limiting factors for bioremediation of dioxin compounds in contaminated soils of Vietnam.

Airbase 1: Da Nang Airport is located within Da Nang City which has a population density of ~640 persons per square kilometer (km²) and is used by both the Ministry of Defense (MOD) and the Middle Airports Corporation under the Civil Aviation Administration of Vietnam. It has a total area of 820 ha, of which 150 ha are allocated to civil aviation, and the remaining 670 ha are under the jurisdiction of the MOD. The airport property is located within the urban part of Da Nang City and is surrounded by three urban districts: Hai Chau, Thanh Khe, and Cam Le. The three districts are densely populated, with most of the land in these districts used for housing, industrial facilities, transportation and other facilities. A number of people reside on the western, northern and northeastern edges of the airport property in close proximity to the active runways, Sen Lake and wetlands. Many of these are military personnel and their families.

Airbase 2: Bien Hoa Airbase is located in Bien Hoa City, Dong Nai Province, approximately 30 kilometers (km) northeast of Ho Chi Minh City. Bien Hoa City has an average population density of approximately 3,400 persons per km². The Airbase property is adjacent to Trung Dung, Quang Vinh, and Buu Long Wards and lies within Tan Phong Ward. Surrounding areas are densely populated, with most of the land used for housing, industrial facilities, transportation, and associated infrastructure. There was a population of approximately 120,000 people in the area surrounding the Airbase and on the Airbase. The Airbase is an active military airbase and encompasses a total area of approximately 1,000 hectares (ha).

Airbase 3: Phu Cat Airbase is located in Quy Nhon City, at longitude 109°03'57" east and latitude 13°57'48" north. The airbase is bordered by Cap Tan, Nhon Thanh Commune and An Nhon. Phu Cat Airfield was an important US military airbase and Ranch Hand site during the US-Vietnam war, and is currently used for both civil and military purposes. Due to the known dioxin contamination, a ban on food consumption from the lake was implemented in 2002. In an attempt to initially remediate the contaminated runoff from the airstrip, MOD built a concrete remediation structure downstream of the main airbase runoff area in 2002. The population density around the lake and airfield is limited to a small number of airbase workers and residents.

Project 2: Biochar Facilitated Bioremediation: A Green Solution for Dioxin/Furan Pollution. Bien Hoa Airfield in Bien Hoa City, Viet Nam is in the monsoon tropical region with temperate

treatment facilities, and vertical structures. In the box below, describe any construction planned for this project/activity. Refer to [ADS 201maw](#) for required Construction Risk Management procedures.

climate, few floods, storms, and disasters. The average annual temperature is 25-26°C. There are two main seasons. The rain season is from May to October, and the dry season lasts from November to April of the following year. Its rainfall is relatively high from about 1,500 mm – 2,700 mm, the number of annual average sunny hours is 2,200 – 2,600. In the Bien Hoa airbase, there is poor plant and animal ecological health due to defoliant pollution which is currently being managed by the Ministry of Defense. The proposed project includes soil sampling in this area and will not create any adverse effects on the environmental conditions.

Project 3: Nanoassisted bioremediation of diffused dioxins in soil and sediment. The Bien Hoa Airbase in Vietnam has a number of dioxin hotspots. The TCDD concentrations in the Pacer Ivy Area, an herbicide storage and re-drumming location at the western corner of the airbase, reached up to a TEQ of 61,400 pg/g dry weight. Sediments from ponds and lakes located downstream of the hotspot areas that receive drainage from hotspots had dioxin levels reaching up to a TEQ of 5,970 pg/g dry weight. At present, ponds and lakes around the Bien Hoa Airbase are used for fish and vegetable cultivation suggesting a high exposure risk to dioxins through the food chain and through direct exposure to highly contaminated soils and sediments. With the relatively high population density of Bien Hoa city, a large number of people are at risk for developing adverse health outcomes related to these high exposures.

Project 4: Community and Hospital-based Obstetrics WhatsApp Triage, Referral, and Transfer (WAT-RT) System. This project is based at Phebe Hospital in Bong County, Liberia, and Kwame Danso Hospital in Sene West, Ghana. In 2017, the maternal mortality ratio (MMR) in Ghana was estimated at 308 per 100,000 live births. Liberia, with the 9th highest MMR in the world, continues to struggle with reducing these deaths due to a decimated healthcare infrastructure following decades of conflict and the 2014-16 Ebola epidemic. In both Liberia and Ghana, a fundamental gap exists with preventable deaths disproportionately affecting poor women living far from adequate healthcare centers. Standard triage systems for obstetric emergencies are often absent or lacking in most healthcare systems in Ghana and Liberia. Research in other LMICs has shown that maternal mortality is directly related to inadequate or absent triage systems, and that strengthening a triage standard across healthcare facilities is critical to reducing preventable, obstetric-related deaths. The recent development of previously absent obstetric emergency triage systems demonstrates the growing understanding of the importance of these tools and their use among first-line providers.

Project 5: Bridging Higher Education and Practice: Addressing Gender Inequity in STEM and Sanitation in Malawi. Malawi is a low-income country when less than 0.5% of the population has attended University, 34% of households lack an improved toilet facility, and 15% lack safe drinking water (Malawi Government, 2019). This activity aims to improve gender equity in STEM education, with a particular focus on sanitation education. Researchers will first evaluate university curricula on sanitation, and then develop new tools that can facilitate Woman enrollment in sanitation and STEM education. The study aims to improve educational outcomes for women and increase their participation in STEM and sanitation at the level of higher education, to better reflect the outsized role women have in sanitation practice in Malawi.

Project 6: Livelihood Change in the Context of Community Conservation. This project is based in Chobe Enclave, Botswana. The communities are rural villages, without mains electricity, and reliant for the most part on subsistence crop production and livestock rearing. A major feature of daily life for communities in Chobe Enclave, which is surrounded on two sides by protected areas, is regular interaction with wildlife. Human-elephant conflict is particularly high. This project will not have any direct impact on baseline conditions.

Project 7: The evaluation of challenges of youth in Kazakhstan and piloting innovative solutions. Research will be desk-based in Sultan City and Nur-Sultan City, Republic of Kazakhstan. Kazakhstan government measures are implemented on a limited scale and of an ad hoc nature to address NEET youth. Thus, for example, the government's educational interventions, called Free VET, turned out to be ineffective and many graduates of VET programs are currently in NEET status (Shaykhina, 2019). Also, state measures to ensure employment and socialization of NEET youth (Government of the Republic of Kazakhstan, 2018a) do not include mechanisms to prevent the risks of youth becoming a NEET. Youth government programs (Zhasproject.kz, 2020; Government of the Republic of Kazakhstan, 2018b) did not address the topic explicitly and extensively. The issue of NEET youth is still acute. With the current COVID-19 crisis and subsequent cuts and pressure on social spending are set to increase further that will leave disadvantaged youth situations worsened. In this context, attention must be paid to supporting the most vulnerable youth and identification of the good practices to address the issue.

Project 8: Morogoro Youth Empowerment through Establishment of Social Innovation (YEESI) Lab for Problem-centered Training in Machine Vision. The study region of Morogoro is in the eastern part of Tanzania, 196 kilometers (122 mi) west of Dar es Salaam, the country's largest city and commercial center, and 260 kilometers (160 mi) east of Dodoma, the country's capital city. Morogoro lies at the base of the Uluguru mountains. It is an agricultural region with agriculture practiced in all its districts; Morogoro, Gairo, Kilombero, Kilosa, Movomero, and Ulanga. The geology of Morogoro comprises four major rock/lithology types, which includes hornblende-pyroxene granulites, muscovite-biotite gneiss, and migmatites, colluvium and alluvium. The hornblende-pyroxene granulites are the dominant rock types and occupy a major part of the Uluguru Mountains and foothills. Morogoro enjoys hot weather conditions that average as high as 89F during summer and 59F during the winter season. Morogoro receives rains from November to May each year. Hence, Morogoro can support wide varieties of crops grown in the region such as maize, rice, cassava, beans, groundnuts, banana, plantains, sugarcane, vegetables, and sunflower. Morogoro had a population of 2.2 million in 2012. Morogoro had a young population age structure, with 44 percent of the population in the Morogoro region below 15 years of age. Youth Population (15- 35) is more than 35% of the population, and in urban areas is more than 41%. At the current growth, the population of Morogoro will double in the next 30 years. The Morogoro population is predominantly rural, with 71 percent of the total population living in rural areas and engaging in agriculture.

This project will bring impact to youth of the Morogoro region, who are more than 770,000 who can use the ICT tools developed by the project and be trained to use machine vision technologies. Also, since the training will develop machine vision tools for agriculture that are ICT based, the tools can be used by 70% of Tanzania's 55 million people population who are engaged in agriculture.

Project 9: Long-term impacts of land-use/land-cover dynamics on surface water quality in Botswana's reservoirs using satellite data and artificial intelligence methods: case study of Botswana's Limpopo River Basin. The estimated population living in the study area of Botswana's Limpopo River Basin is nearly 1.3 million, with more than 40% of this population living in Gaborone, Francistown and the surrounding towns. Apart from urban settlements, agriculture is the main activity within the basin and is primarily rainfed even though the basin has high variability of rainfall. The climate within the ecoregion is arid and semi-arid, which is hot and wet during summer and cool and dry during winter. The mean annual rainfall within the basin varies between 200 mm/year in the west and 1500 mm/year in the east, with the basin receiving approximately 500 mm/year. The mean daily air temperature across the basin varies

from 0C in winter to 39C in summer. Despite the high humidity, the air quality is generally good. The soils in the region consists of moderately dry red loamy mokata soils on the plains, or mixed chalky and sandy chawana soils, with brownish rocky seloko soils on and around hills.

The larger biomes encompassing the ecoregions of the basin include savannas, shrublands and xeric shrublands, with montane grasslands in the higher elevation regions. The basin is rich in wildlife, with protected national parks located across the basin. There are over 160 species of mammals including lion, African wild dog, zebra, cheetah, spotted hyena, antelopes, bushbucks, reedbuck, and impala among other mammals and more than 400 species of birds. The main land-use activities include settlements, agriculture, mining and industry. The human settlements and the activities depend on the reservoirs and dams for water supply. The entire country relies on the ten main dams and several small reservoirs that are located within the basin. The reservoirs are mainly fed by the river waters.

Project 10: Engaging the private sector in increasing voluntary use of long acting reversible contraceptives and permanent family planning methods in rural areas of Bangladesh. Natore is a district of Rajshahi Division located in northern Bangladesh. Natore district mostly consists of plain land. The district consists of 6 sub-districts (Upazilas), 52 unions, 1272 mauzas, 1351 villages, 8 paurashavas, 75 wards and 161 mahallas. The upazilas under Natore District are: Natore Sadar, Bagatipara, Baraigram, Gurudaspur, Lalpur and Singra. The road distance from Natore to Dhaka is 220 kilometers.

Project 11: Young Wives: An Exploratory Study of Married Women Below Twenty and the Socio-Cultural Determinants of their Contraceptive Behavior in Low Resource Settings in India.

District 1: Godda (Jharkhand) – Godda lies about 87 meters above sea level and in the northeastern part of the state. Godda is marked by hills and small forests. The coal mines in Godda are amongst the biggest in Asia. Godda is on the way to becoming India's first power sector Special Economic Zone by virtue of an upcoming 1600 MW thermal power plant. The main economic activity is agriculture and major crops are paddy, wheat and maize (corn). The area that now comprises Godda district used to be part of the erstwhile Santhal Parganas district. Santhals are a predominant tribe in Godda, which makes it culturally unique compared to some of the other districts of Jharkhand.

District 2: Dhubri (Assam) – Dhubri lies at 89.5 degrees east longitude and 26.1 degrees north latitude, and about 34 meters above sea level. Dhubri is called the "Land of Rivers" as it is surrounded on three sides by Brahmaputra and Gadadhar rivers. This makes certain areas of the district difficult to reach particularly when one is in need of emergency health services. As is typical for Assam and neighboring Tripura, Dhubri has a monsoon-influenced humid sub-tropical climate, being a little too cool to qualify as a tropical monsoon climate. The cool season from November to February is warm to very warm during the afternoon, and pleasantly cool in the morning. The hot season of March-April sees increasing humidity and rain, leading into the extremely humid and wet monsoon season from May to mid-October.

Dhubri is home to two internationally recognized wetlands. It consists of rare specimens of trees, shrubs, medicinal plants, mammals (including the rare Golden Langur), reptiles and exquisite birds and insects. Unlike the upper reaches of Assam, where tea plantations are the main agricultural activity, Dhubri is characterized by paddy (rice) cultivation apart from jute and mustard seed. Dhubri is one of the most densely populated districts in India with 1,171 inhabitants per sq km. This implies a high load on the natural resources and social-economic

infrastructure in the district. The largest religious group in the district are the Muslims (80%), which has meant that the socio-cultural norms followed in Dhubri are remarkably different from those in many other parts of Assam.

Project 12: Assessment and Comparison of Recovery of Biodiversity and Carbon Sequestration in Philippine Mangroves Among Natural, Replanted and

Naturally-recolonized Mangrove Stands. The study will be conducted in the provinces of Oriental Mindoro (south Luzon) and Panay Island (west Visayas), Philippines. These regions are known for high mangrove plant and faunal biodiversity, with the island of Mindoro being listed as a UNESCO Biosphere Reserve.

Project 13: Assessment of the resilience of Local Baladi goats in Lebanon: a viable sustainable solution to a changing climate in a transhumant system.

The study will be conducted in Bekaa Valley, Terbol and Bar Elias, in the Zahleh District of Lebanon, and the research facility will be the Lebanese Agricultural Research Institute located in Fanar, Lebanon. In Lebanon, small ruminants occupy about 40% of the animal production sector (Lebanese Ministry of Agriculture, 2010) with approximately 516,000 goats (FAOSTAT, 2016). The dual purpose Baladi goat is the predominant dairy goat (Hajj, 1999; Srour, 2006; Tabet et al., 2016), and is well adapted to the local harsh rearing conditions (Hamadeh et al., 2001; Abi Saab et al., 2011; Tabet et al., 2016) of feeding scarcity, travel and heat stress. The majority of flocks are managed under extensive systems based on natural rangelands and crop residues (Hamadeh et al., 2001; Hosri and Nehme, 2006; Chedid et al., 2018), especially in the Bekaa region (Abi Saab et al., 1997). Natural rangelands of the mountainous areas consist mainly of shrubby vegetation of maquis and garrigue (Dumont et al., 1995; Perevolotsky et al., 1998; Aharon et al., 2007; Rogosic et al., 2008), and are exploited during spring (Cooper and Bailey, 1990; Chedid et al., 2018) as their nutritional value declines dramatically during the dry summer season (Cabiddu et al., 1999; Srour, 2006). These conditions explain the low performance reported for the Baladi goat with short (140 to 180 days) lactation (Hamadeh et al., 2001; Kharrat and Bocquier, 2010b, a), low milk yield (120 to 140 kg) (Kharrat and Bocquier, 2010b, a) and low reproductive performance of 1.3 kids per goat (Hajj, 1999).

A large proportion of these farmers are landless and are faced with a global, natural and agricultural land scarcity (Hamadeh et al., 2001; Srour, 2006), further threatening the sector's sustainability (Srour, 2006), a trend accentuated by the influx of Syrian refugees and their small ruminant flocks (FAO, 2014 in Chedid et al., 2018). Furthermore, the recent global climatic changes are also affecting Lebanon among other countries, with extreme weather conditions reported since 2010: lower precipitation during the winter and higher temperatures during the summer (MoE/GEF/UNDP, 2015; LARI, 2017). These conditions are more likely to persist or worsen during upcoming years according to the forewarnings of the Lebanese Agricultural Research Institute. In this particular agroclimatic and environmental context, the Baladi goat is an important component of the livelihood of farmers, allowing their resilience in their farmland and sustainability of the rural community.

Project 14: Biodiversity correlates of sustainable value chain expansion in the Brazilian Amazon: Developing combined environmental DNA (eDNA) and camera trapping

protocols to assess vertebrate diversity in managed Brazil nut forests. Lago do Cuniã Extractive Reserve and the adjacent Cuniã Ecological Station, Brazil. Both are located in the northern portion of Rondônia state, Brazil, on the border with Amazonas state, in the Madeira – Purus interfluvium. Both are managed by the federal Chico Mendes Institute for Biodiversity Conservation (ICMBio).

The Lago do Cuniã Extractive Reserve and Cuniã Ecological Station have four primary upland forest types. The Extractive Reserve additionally has seasonally flooded forest along the Madeira River, and the Ecological Station has some natural savanna and woodland. Brazil nut trees grow in the upland forests in both protected areas. The Ecological Station has an established and well-used research trail grid, managed by the University of Rondônia and the federally funded Program for Research in Biodiversity (PPBio). The two reserves and their surrounding region are known to support 122 non-volant mammal species, of which 19 are on the threatened species list for Brazil; 454 bird species, of which 14 are threatened; 170 amphibians, of which 4 are threatened or vulnerable or lack sufficient data; 179 reptiles, of which 7 are threatened or vulnerable or lack sufficient data; and 494 fish species, of which 10 are threatened or vulnerable. The protected area mosaic and surrounding landscape in which these two reserves are embedded is subject to several pressures and threats, including an advancing deforestation frontier to the south; two recently built dams upstream on the Madeira river; artisanal gold mining (garimpo), the paving of the BR-319 and BR-320 roads to the south and northwest, incursions by illegal fishermen, and illegal harvesting of turtles and their eggs. Despite these high levels of infrastructure-related threats, the reserves are currently considered to be in very good conservation status.

Project 15: Inclusive Economic Growth for Sustainable Peace? Assessing Development Mechanisms and Conservation Efforts in Post-Conflict Colombia. The activities will be conducted in Colombia, particularly the capital city of Bogotá and four regions in the country. With over nine million victims of a fifty-year armed conflict, and continued levels of violence in the territories, Colombia faces a great challenge to secure enduring peace. Although the largest remaining armed actor in the conflict demobilized, violence has continued after 2016, with over 500 human rights defenders and social leaders murdered (Rojas Andrade 2020) and the ongoing forced displacement of communities (Spindler 2017). Varied illegal armed groups control areas of the territory and are involved in drug trafficking. According to UNODC, the hectares of coca leaves have actually increased since the 2016 Agreement (UNODC 2018). The uncertainty of land governance following the 2016 peace agreement has also led to an increase in deforestation activity within many protected areas and in frontier zones (Armenteras and Defler 2019; Armenteras et al 2019).

Project 16: Assessment of Geothermal Energy Resources and Natural Hazards in Armenia. Gegham and Javakheti volcanic ridges are characterized by high altitudes (2000 to 3500 m above sea level) and are not populated. During summer, some semi-nomadic ethnic minority groups move to temporary sites with seeps; therefore, areas are characterized by low level of soil use and environmental conditions are favorable, with low level of man-made impacts. Wild animal and plant resources are studied in detail by the Institutes of Zoology and Botany of the Armenian National Academy of Sciences. Under the proposed project, the research team plans only camping in the field, deployment of geophysical and seismological temporary networks, and geological field work without trenching or other activity that may affect environmental conditions of highland areas.

Project 17: Improving human livelihoods through holistic conservation of Malagasy orphaned plants, the iconic Baobab trees. The proposed project sites are located in the Menabe Region in Madagascar, which covers an area of 48,860 km². The Menabe Region has 483 plant species with 91% of them being endemic plants. There are 278 animal species, including terrestrial and marine animals. The total inland renewable water resources are important in this region, with the presence of nine lakes and four huge rivers to provide water sources to the local population. With a total surface area of 48,860 km², a total population estimated at 828,649 inhabitants (of which 79.2 % are living in rural areas) in 2015 and an

average population density of 17 inhabitants/km² (39 inhabitants/km² at the national level), the Menabe Region is the fifth least populated region of Madagascar. Nevertheless, in terms of evolution, in the space of 22 years, this density has almost tripled. The Menabe Region remains a former migration area and the migration has been accentuated within the last five years. The Menabe Region has the ecological characteristics of the western low altitude zones between 0 - 800 m altitude, including a bioclimate of warm subhumid type, average temperature > 20°C, the annual precipitation between 200 and 500 mm and a dry period between 6 to 7 months. The soil is of tropical ferruginous types.

Project 18: Multi-Scale, Interdisciplinary Integrated Analysis of Societal and Ecosystem Values of Peruvian Amazon Peatlands. This project is located in the Peruvian Amazon (Loreto and Ucayali departments), and precise sites will be identified at the beginning of the project as per the project timeline.

Project 19: Creating knowledge on cocoa pollinators in agroforestry systems of the Dominican Republic for improving plantation management practices. Three cocoa-producing provinces in Dominican Republic: Barahona, San Cristóbal, and Duarte. The Dominican Republic (D.R.) is the first world exporter of organic cocoa with more than 153,000 has cultivated and 85,000 tons exported in 2018 (FAOStats, 2018). This commodity plays a strong role in the economy and supports more than 36,000 producers and their families. Cocoa's most important diseases such as frosty pod rot (*Moniliophthora roreri*) or witches' broom (*Moniliophthora perniciosa*) are absent in the D.R. This situation offers comparative and competitive advantages over other Latin American cocoa-exporting countries, where these diseases can affect up to 90% of cocoa yields and must often be treated using chemical fungicides. Hence, most cocoa plantations in the country are managed without chemical inputs and many are under organic certification schemes, giving the D.R. international leadership as the first organic cocoa exporter worldwide. The vast majority of Dominican cocoa plantations are cultivated under agroforestry schemes (Notaro et al., 2020). Cocoa-based agroforestry systems (Cocoa AFS) are cropping systems based on a perennial crop, the cocoa tree (*Theobroma cacao* L.), where farmers intercrop several other annual and perennial crops (Deheuvels et al., 2012). In the D.R., we found that farmers associate more than 45 plant species with cocoa (Deheuvels, 2015) in heterogeneous patterns, thus creating a variety of habitats for cocoa pollinating insects (Deheuvels et al., 2017). These cocoa AFS are known for their Biodiversity conservation value and are often found near protected forest patches where they buffer the transition between forest and agricultural land. However, it has been shown that plant species found in cocoa AFS strongly differ from those found in nearby forest fragments (Deheuvels et al., 2014).

Project 20: Phytochemical, biological and toxicological evaluation of hop (*Humulus lupulus* L.) from populations growing wild in Kosovo. This project seeks to evaluate the molecular, genetic, and chemical variability in the Kosovan wild hop germplasm using PCR and DNA analyses. Microsatellite (SSR) DNA analysis will be used as a method to study individual genotyping, population structure, and phylogeny of Hops. Bioactive compounds will be extracted from the hops using standard extraction methods, while their chemical composition will be characterized using analytical tools (GC-MS for terpenes and HPLC-PDA for bitter acids). The project will test whether plant extracts and their fractions have antioxidant activity, by using DPPH and FRAP methods, while the cyto- and genotoxic properties will be assessed by using the Allium test. Researchers and post-graduate students will be trained in DNA analyses and phytochemical laboratory techniques.

Project 21: Solar dryer integrated with energy storage system: An energy efficient and environmentally friendly technology for drying biomaterials in Tanzania. The primary objective of this study is to develop an inexpensive, effective, reliable, and environmentally benign drying technology. The dryers will be incorporated with solar collector(s) and an energy-storage system made of carbonate (dolomite and limestone) and granitic rocks. The rock bed thermal energy-storage will be made of three layers using aluminum sheets on the inside and outside and insulating materials (fiber glass) in the middle. The number of rocks in the bed will depend on their sizes and shapes, however, the total mass is expected to be 50 kg. The drying chamber (cabinet type) will be constructed with drying trays and adjustable racks to place products close to the rock bed storage and to allow for air circulation. The drying air will be circulated in the system using a blower which will be powered by electricity from the grid or small PV system in remote areas where there is no national grid. The dryer will be installed at Nelson Mandela African Institution of Science and Technology (NM-AIST) located at Tengeru in Arusha, Tanzania.

Project 22: Improving sustainability and resilience of Peruvian Amazon systems through silvopastoralism. The project will be carried out in Juan Guerra district in the San Martin Region of Peru. In the Peruvian Amazon, 77% of the population is exclusively dedicated to agricultural activities, out of which 21% of the population in the San Martin region owns cattle. Raising cattle in the rural areas of San Martin region is an economically important activity; however, this activity has resulted in significant changes in land-use over time, mainly due to deforestation and utilization of wood for timber, fire, and charcoal, and subsequent establishment of tree-less pastures to feed cattle.

The Juan Guerra district, which belongs to the province of San Martin, is located in the subtropical dry forest Holdridge's life zone, between the latitudes 6°37'16.54"S and longitude 76°21'2.45"W. It has an altitude of 200 masl. The extension of the territory is 196,50 km², and has approximately 3 907 hab. The climate is warm and moderately rainy with a temperature of 17-35oC and a rainfall level between 1,000 - 1,500 mm per year. The texture soil ranges from loam to clay loam.

Project 23: Agrivoltaic Technology in Drylands of West Africa: Strengthening National Innovation Systems for Diffusion and Market Development at the Water-Energy-Food Nexus.

Research field 1 (Kumasi): The proposed experimental site in the city of Kumasi (Fumesua Community) is a research field dedicated to experiments at the CSIR Crop Research Institute (CSIR-CRI). The research fields of the CSIR-CRI, Fumesua station in Kumasi, is bordered by 3 neighboring communities. The research fields cover an approximate area of 150 ha with two dugout water reservoirs for irrigation. The capacities of the reservoirs are estimated at 36,896 m³ and 6,868 m³. The soils in the area are predominantly Haplic Lixisols (Asuansi series) with intermittent spots of Gleyic Lixisols (Akroso series). The soils of the deep yellowish red, well drained Asuansi series occupies summits and middle slopes of the research fields whilst the middle and lower slopes are occupied by yellowish brown and poorly drained Akroso series. The top soils are coarse sandy loam with an underlying gritty clay and/or clayey loam soils. The research fields are bordered by trees (forest) in three directions and interspaced also with trees that serve as windbreaks to the bare and cleared fields. The forests are home to a wide species of trees and animals. The project will not disturb any natural resource in the area.

Research field 2: (Tamale): The site in Tamale is located in a savanna farming area, and not close to trees or water bodies, as shown in the location photo above. The site is in the

Kanshegu farming community and is strategically selected so that many farmers would have easy access to the site during the project implementation, as well as use real farmer field experiences for trainings. The site lies within the savanna belt of Northern Ghana. The main soil types include sand, clay and laterite ochrosols. Northern Ghana is a major food cropping area in Ghana.

Project 24. Climate mitigation potential of Colombia's lowland peatlands: distribution, emission factors and conservation priorities. Colombian amazon region, and specific sites in the northwestern and eastern portions of the Colombian Amazon. The visited sites are tropical rain forests ranging from the line of deforestation on the western side of the region and under different disturbances regimes (drainage, land use change, fires) to more natural sites on the eastern portion of the region. Flora and fauna are typical of the Amazon forest with a high diversity of species in relatively pristine environments.

The project will not interact with elements outside the wetland peatland system. Interaction with the societies around the selected sites will be based on dialogues to access the sites and on any type of feedback to the communities about the results of our study. Sites are located across a disturbance gradient that includes the expansion of pastures for cattle and the associated deforestation in the western part of the Colombian amazon.

Project 25: Enhancing capacity of local communities in Laikipia County, Kenya: increasing preparedness and response to emerging infectious diseases in parallel with preservation of biodiversity. The project will conduct social surveys, workshops, and field visits in the county of Laikipia, Kenya. The project lies in a savannah ecosystem which is dominated by Acacia shrubs and grass with a few forbs as undergrowth dotted by bare patches and occasional tall trees. The relative amounts of vegetation in Laikipia County vary with the land use types. The community areas that the project will be targeting have relatively lower undergrowth and more bare ground due to higher numbers of grazing livestock, i.e., sheep, goats, cattle and camels. Wildlife species using this habitat are for example giraffes, elephants, Thompson's and Grant's gazelles, waterbucks, leopards, hyenas, mongooses, genets, squirrels etc. Generally, the number of livestock and wildlife has been increasing in Laikipia County. Water resources are scarce much of the year restricted to water pans and a few seasonally flowing rivers. The community, wildlife and livestock share these sources and have to travel long distances especially during the dry season to access the often poor quality water. The growing human population and sedentarization may further exacerbate the situation increasing conflict among humans in search of water for the livestock; human-wildlife conflict and zoonotic diseases as there is an unusually high congregation of livestock, wildlife and humans.

Project 26: The Effects of Excessive Water Use and Agricultural Intensification on Aral Sea Shrinkage: Socioeconomic-Environmental Systems Dynamics within the Syr Darya River Basin. The project will conduct research focused on three districts of Kazakhstan: Aralskiy, Syrdariya and Zhanakorganskiy, that are located in the upper, middle and lower sections of the Syr Darya River.

One of the most dramatic changes in the earth's surface over the past 60 years has been the shrinking of the Aral Sea in Central Asia – one of the 20th century's worst environmental disasters and an example of ecosystem collapse. Today, the North Aral Sea and South Aral Sea continue to shrink, and the South Aral Sea actually disappeared during 2009-2014 (<https://earthobservatory.nasa.gov/world-of-change/AralSea>). The causes of these dramatic changes are the warming climate and, more importantly, extensive agricultural development since 1960 that excessively withdrew water from tributary rivers for water-intensive crops such

as cotton and rice (Gutman et al. 2020). Two large rivers flow into this gigantic inland lake - the Syr Darya in the northeast and the Amu Darya in the south, which are fed by melting glaciers and snow in the mountainous regions of the Pamir Mountain and Tianshan Mountain. The Syr Darya River has seen an increased number of hydrological dams and record low stream flow in recent decades – evidence of more controls on water supplies to the Aral Sea.

Intensifying and extensive irrigation agriculture, constructing large dams/reservoirs, and developing large tracts of new lands for agriculture remain the current strategic plans of the government. These land use activities have been widely recognized for their roles in further deteriorating the ecosystem functions of the greater Aral Sea (Cai et al. 2003, Micklin 2010, Egamberdieva & Öztürk 2018). Among the many direct influences is the water loss through evapotranspiration (ET) – the largest water flux factor for the Aral Sea basin. Based on the most recent global ET calculations at the LEES Lab (i.e., our USG partner), annual water loss through ET is 304.9 ± 17.2 mm in the Kyzylorda region, which is 12.3% higher than the national average (273.1 ± 27.2 mm), regardless of region's position in a more arid environment. The long-term trends in ET here since 1982 have been very stable, which contrasts with significant increases in drylands (Jung et al. 2011, Chen et al. 2020) and the increase of 11.8 mm per decade in Kazakhstan. The smaller inter-annual variation of ET in Kyzylorda compared to the national average suggests that the landscapes there are more “regulated” by agricultural development and water withdrawals. The high and stable net primary production (NPP) in three districts along the Syr River provide additional evidence of the need for human interventions. Here there is an urgent need for scientific efforts to tease apart the influences of humans and climate and to apply this understanding on the watersheds adjacent to the sea, such as the Syr Darya River Basin (SDRB), which is the largest watershed for the Aral Sea (UNECE 2015).

Project 27: Renewable Hydrogen Generation with Carbon Recycling (ReHyCaRe) from Biogenic Residues of Bangladesh.

The Green Energy Knowledge Hub (GEKH) at the Department of Farm Power and Machinery, Bangladesh Agricultural University, has two entrances (main entrance in the east, and biogenic residues receiving & disposal entrance on the north). The laboratory currently houses several pieces of equipment, dedicated for research in feed characterization, batch and CSTR studies (e.g., incubator, muffle furnace, oven, pH meter/conductometer, thermo reactor, and biogas test plants [continuous-flow stirred tank reactor unit] etc.).

The Clean and Affordable Energy Lab of the Applied Chemistry and Chemical Engineering Department at University of Dhaka has two entrances (on the north side of the room) and two fume cupboards. The laboratory currently houses several equipment, dedicated for research in carbon capture via solvent extraction and chemical looping process, water treatment using various adsorbents and membrane filters and set up for sample preparation (e.g., oven, sieve, pelletizer).

The kinetics laboratory at the Chemical Engineering Department (ChE), Bangladesh University of Engineering and Technology, has three entrances (two one the north and one on the south). The laboratory currently houses several equipment, dedicated for research in biomass processing (e.g., drying, pyrolysis, torrefaction, carbonization), reaction engineering (e.g., catalyst preparation, high temperature reactor), and for sample preparation (e.g., oven, sieve, pelletizer, moisture analyzer).

The laboratory work in these three laboratories is performed through hazard identification, risk assessment and application of risk control for individual equipment and process. All laboratory personnel are inducted and allowed to work following standard operating procedures (SOPs).

The laboratory generates waste in gaseous, solid, and liquid forms in low quantities. Gaseous emissions are vented to the atmosphere through the gas extraction system. Solid and liquid wastes are segregated and collection in collection vessels according to their hazard classification prior to controlled disposal as per DoE's directives.

Project 28: Water Harvesting at Community Level for Enhanced Access to Ground Water

The research will be facilitated in Herat University, located in the province of Herat, Afghanistan. Site visits will be conducted in areas within the Harirud River Basin of Afghanistan. Herat city is ranked as extremely high water-stressed based on the World Resources Institute; economic development, agricultural activities, and urbanization in recent years are adding to the challenge of access to water resources. Although, use of solar energy made it easier to access the groundwater but ignoring sustainable access, monitoring and proper management can cause significant challenges for the residents of a densely populated city.

2.2 APPLICABLE AND APPROPRIATE PARTNER COUNTRY AND OTHER INTERNATIONAL STANDARDS (E.G. WHO), ENVIRONMENTAL AND SOCIAL LAWS, POLICIES, AND REGULATIONS

Environmental and social laws, policies, and regulations differ depending on the country of project implementation. Grantees are responsible for identifying and complying with relevant partner country environmental and social requirements.

3.0 ANALYSIS OF POTENTIAL ENVIRONMENTAL RISK

PROJECT 1: DEVELOPING A FRAMEWORK FOR THE IDENTIFICATION OF SOIL LIMITING FACTORS FOR BIOREMEDIATION OF DIOXIN COMPOUNDS IN CONTAMINATED SOILS OF VIETNAM

TABLE 3A. POTENTIAL IMPACTS – PROJECT 1

Sub-Activity	Potential environmental and social impacts
Sub-activity 1.1: Survey (21 soil samples) of residual concentration of aged dioxin compound in air base soils	<ul style="list-style-type: none"> • Dioxin, its congeners and dioxin-like compounds are highly toxic to humans, animals, and the environment. • Improper disposal of toxic soil samples could lead to soil and water contamination or risks to human health and safety. • Soil sampling for scientific studies and professional activities increases soil loss, because the samples—especially if an excessive amount—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale, sampling may increase the erosion rates of the natural and other human-induced processes. • Disturbed dioxin-contaminated soils may become airborne due to wind erosion and/or vehicular or construction-related disturbances. • Bush burning has traditionally been carried out annually

	on the grounds at the Bien Hoa airbase; this increases the risk of higher dioxin congeners (e.g., OCDD) entering the environment.
Sub-activity 1.2: Soil property analysis	None
Sub-activity 1.3: Isolation and screening of biosurfactant producing bacteria	None
Sub-activity 1.4: Isolation and characterization of dibenzofuran (DF) degrading bacteria	None
Sub-activity 1.5: Bioremediation experiments in microcosms (lab)	None
Sub-activity 1.6: Testing lab bioremediation treatments at field sites	<ul style="list-style-type: none"> • Dioxin, its congeners and dioxin-like compounds are highly toxic to humans, animals, and the environment. • Improper disposal of toxic soil samples could lead to soil and water contamination or risks to human health and safety. • Disturbed dioxin-contaminated soils may become airborne due to wind erosion and/or vehicular or construction-related disturbances. • Bush burning has traditionally been carried out annually on the grounds at the Bien Hoa airbase; this increases the risk of higher dioxin congeners (e.g., OCDD) entering the environment.
Sub-activity 1.7: Continued sampling/testing for results	<ul style="list-style-type: none"> • Same as Sub-activity 1.1

PROJECT 2: BIOCHAR FACILITATED BIOREMEDIATION: A GREEN SOLUTION FOR DIOXIN/FURAN POLLUTION

TABLE 3B. POTENTIAL IMPACTS – PROJECT 2

Sub-Activity	Potential environmental and social impacts
Sub-activity 2.1: Obtain and prepare biochar feedstocks..	<ul style="list-style-type: none"> • Pyrolysis of biochar can produce greenhouse gas emissions, contributing to climate change • Biochar can encourage deforestation.
Sub-activity 2.2: Elemental analysis of biochars and feedstocks	<ul style="list-style-type: none"> • Carbonization/pyrolysis of feedstock, such as sawdust or coconut shells, can generate dioxins or furans (D/F). Using biochar with quantifiable levels of D/F, and not being aware of it, could bias the results of the study.
Sub-activity 2.3: Soil Samples from test site – containing agent orange 3	<ul style="list-style-type: none"> • Dioxin, its congeners and dioxin-like compounds are highly toxic to humans, animals, and the environment. • Improper disposal of toxic soil samples could lead to soil and water contamination or risks to human health and safety. • Soil sampling for scientific studies and professional activities increases soil loss, because the samples—especially if in excessive amount—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale, sampling may increase the erosion rates of the natural and other human-induced

	<p>processes.</p> <ul style="list-style-type: none"> • Disturbed dioxin-contaminated soils may become airborne due to wind erosion and/or vehicular or construction-related disturbances. • Bush burning has traditionally been carried out annually on the grounds at the Bien Hoa airbase; this increases the risk of higher dioxin congeners (e.g., OCDD) entering the environment.
Sub-activity 2.4: Testing sorptive capacity of biochars	<ul style="list-style-type: none"> • Dioxin, its congeners and dioxin-like compounds are highly toxic to humans, animals, and the environment. • Improper disposal of toxic soil samples could lead to soil and water contamination or risks to human health and safety.
Sub-activity 2.5: Analysis of sorptive removal capacity of biochars	<ul style="list-style-type: none"> • See Sub-activity 2.4
Sub-activity 2.6: Development of online courses and videos on bioremediation, environmental microbiology, and environmental chemistry to build capacity of students.	None

PROJECT 3: NANO-ASSISTED BIOREMEDIATION OF DIFFUSED DIOXINS IN SOIL AND SEDIMENT

TABLE 3C. POTENTIAL IMPACTS – PROJECT 3

Sub-Activity	Potential environmental and social impacts
Sub-activity 3.1: Samples and enrichment	<ul style="list-style-type: none"> • Dioxin, its congeners and dioxin-like compounds are highly toxic to humans, animals, and the environment. • Improper disposal of toxic soil samples could lead to soil and water contamination or risks to human health and safety. • Soil sampling for scientific studies and professional activities increases soil loss, because the samples—especially if in excessive amounts—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale, sampling may increase the erosion rates of the natural and other human-induced processes. • Disturbed dioxin-contaminated soils may become airborne due to wind erosion and/or vehicular or construction-related disturbances. • Bush burning has traditionally been carried out annually on the grounds at the Bien Hoa airbase; this increases the risk of higher dioxin congeners (e.g., OCDD) entering the environment.
Sub-activity 3.2: Lab experiments using anaerobic and aerobic digestion	None
Sub-activity 3.3: Pilot scale onsite treatment using best results from	<ul style="list-style-type: none"> • Same as Sub-activity 3.1

experiment	
Sub-activity 3.4: Design of full-scale treatment	<ul style="list-style-type: none"> Same as Sub-activity 3.1
Sub-activity 3.5: Disseminate results and provide capacity building for local partners.	None

PROJECT 4: COMMUNITY AND HOSPITAL-BASED OBSTETRICS WHATSAPP TRIAGE, REFERRAL, AND TRANSFER (WAT-RT) SYSTEM

TABLE 3D. POTENTIAL IMPACTS – PROJECT 4

Sub-Activity	Potential environmental and social impacts
Sub-activity 4.1: Participatory action research to identify health system challenges and learning needs assessment of WhatsApp	None
Sub-activity 4.2: Protocol design for WAT-RT	None
Sub-activity 4.3: Training of trainers on implementation of WAT-RT system at 40 clinics and 2 hospitals	<ul style="list-style-type: none"> Improper management and disposal of healthcare waste can lead to disease transmission; air, soil and water pollution; and risks to human health and safety.
Sub-activity 4.4: Assessment of current OB triage protocols	None
Sub-activity 4.5: Interactive triage training for emergency and labor & delivery personnel at hospitals	<ul style="list-style-type: none"> Same as Sub-activity 4.3
Sub-activity 4.6: Monitoring and Evaluation	None

PROJECT 5: BRIDGING HIGHER EDUCATION AND PRACTICE: ADDRESSING GENDER INEQUITY IN STEM AND SANITATION IN MALAWI

TABLE 3E. POTENTIAL IMPACTS – PROJECT 5

Sub-Activity	Potential environmental and social impacts
Sub-activity 5.1: Gender inequity research in sanitation and STEM	None
Sub-activity 5.2: Curriculum development and training materials to address gender inequity gaps	None

PROJECT 6: LIVELIHOOD CHANGE IN THE CONTEXT OF COMMUNITY CONSERVATION

TABLE 3F. POTENTIAL IMPACTS – PROJECT 6

Sub-Activity	Potential environmental and social impacts
Sub-activity 6.1: Database alignment of existing data sets	None
Sub-activity 6.2: Development of compound variables and indices to represent different types of capital	None
Sub-activity 6.3: Statistical modeling	None
Sub-activity 6.4: Development of adaptive capacity index	None
Sub-activity 6.5: Analysis write-up	None

Sub-activity 6.6: Report back to communities	None
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PROJECT 7: THE EVALUATION OF CHALLENGES OF YOUTH IN KAZAKHSTAN AND PILOTING INNOVATIVE SOLUTIONS

TABLE 3G. POTENTIAL IMPACTS – PROJECT 7

Sub-Activity	Potential environmental and social impacts
Sub-activity 7.1: Desk studies on existing evidence on youth NEET (not in employment, education, or training) interventions	None
Sub-activity 7.2: Determine NEET youth profile in Kazakhstan through qualitative studies/surveys	None
Sub-activity 7.3: Research capacity activities to improve the understanding of lab and field experimental methods; training of research members in experimental evaluation methods	None
Sub-activity 7.4: Implementation of lab and field experiments in Kazakhstan - focused on youth attitudes and trust in institutions and government, as well as behavioral intervention based on youth attitudes	None, if protocols for protection of human subjects are followed.
Sub-activity 7.5: Policy recommendations, capacity building, and reporting.	None

PROJECT 8: MOROGORO YOUTH EMPOWERMENT THROUGH ESTABLISHMENT OF SOCIAL INNOVATION (YEESI) LAB FOR PROBLEM-CENTERED TRAINING IN MACHINE VISION

TABLE 3H. POTENTIAL IMPACTS – PROJECT 8

Sub-Activity	Potential environmental and social impacts
Sub-activity 8.1: Develop a project-centered learning curriculum for Machine vision	None
Sub-activity 8.2: Develop a program to be hosted under ITCB to train Morogoro Youth to solve Machine vision problems	None
Sub-activity 8.3: Develop hackathons, local competitions to solve agricultural problems using Machine vision	None
Sub-activity 8.4: Develop an awareness program to engage universities in Morogoro on Machine Vision and its applications in agriculture	None
Sub-activity 8.5: Establish social innovation lab (YEESI) to provide consultancy services	None

PROJECT 9: LONG-TERM IMPACTS OF LAND-USE/LAND-COVER DYNAMICS ON SURFACE WATER QUALITY IN BOTSWANA'S RESERVOIRS USING SATELLITE DATA AND ARTIFICIAL INTELLIGENCE METHODS: CASE STUDY OF THE BOTSWANA'S LIMPOPO RIVER BASIN

TABLE 3I. POTENTIAL IMPACTS – PROJECT 9

Sub-Activity	Potential environmental and social impacts
Sub-activity 9.1: Mapping and quantifying the	None

spatio-temporal land-use and land-cover (LULC) patterns in the Limpopo River Basin (LRB) from 1984-2019 to create a forecasting model	
Sub-activity 9.2: Quantify and analyze the correlation between water availability and the determinant water quality parameters in LRB	None
Sub-activity 9.3: Develop and compare different machine-learning AI models for the simulation and prediction of the trend impacts of LULU change on water quality and water availability	None
Sub-activity 9.4: Determine the significant water quality parameters in the reservoir water bodies and develop empirical models from the in site measurements and spectral reflectance analyses using UAV-borne spectrometer observations combined with satellite data for near-real-time estimation of reservoirs water quality	None
Sub-activity 9.5: Derive an empirical framework that interlinks and accounts for the interactions and relations between the land and water systems, and their inter-linkages with socio-economic development and climate change with potential impacts on rural and urban communities	<ul style="list-style-type: none"> Policy guidance and recommendations on land and water use management can have significant indirect impacts if the totality of potential environmental and social impacts is not taken into consideration.

PROJECT 10: ENGAGING THE PRIVATE SECTOR IN INCREASING VOLUNTARY USE OF LONG-ACTING REVERSIBLE CONTRACEPTIVES AND PERMANENT FAMILY PLANNING METHODS IN RURAL AREAS OF BANGLADESH

TABLE 3J. POTENTIAL IMPACTS – PROJECT 10

Sub-Activity	Potential environmental and social impacts
Sub-activity 10.1: Develop messages and leaflets on pregnancy care	None
Sub-activity 10.2: Rapid program readiness assessment of private intervention clinics	None
Sub-activity 10.3: Identify and prepare list of pregnant women in the study areas	None
Sub-activity 10.4: Development of simple mobile phone-based messaging system	None
Sub-activity 10.5: SMS messaging of identified pregnant women to promote institutional delivery and post-partum family planning (PP-FP) after delivery	<ul style="list-style-type: none"> There are minimal risk associated with insensitive messaging and counselling (e.g., lack of awareness and understanding of cultural norms) that can lead to negative social impacts and negative attitudes about the project
Sub-activity 10.6: Counseling of pregnant women in private clinics	<ul style="list-style-type: none"> Same as Sub-activity 10.5
Sub-activity 10.7: Training on technical and ethical issues to private clinic staff involved in program services	<ul style="list-style-type: none"> Improper management and disposal of healthcare waste can lead to disease transmission; air, soil, and water pollution; and risks to human health and safety.
Sub-activity 10.8: Trainees provision of delivery care and	<ul style="list-style-type: none"> Same as Sub-activity 10.7

PP-FP services as per choice of the mothers	
Sub-activity 10.9: Monitoring	None

PROJECT 11: YOUNG WIVES: AN EXPLORATORY STUDY OF MARRIED WOMEN BELOW TWENTY AND THE SOCIO-CULTURAL DETERMINANTS OF THEIR CONTRACEPTIVE BEHAVIOR IN LOW RESOURCE SETTINGS IN INDIA

TABLE 3K. POTENTIAL IMPACTS – PROJECT 11

Sub-Activity	Potential environmental and social impacts
Sub-activity 11.1: Study the socio-cultural norms including gender roles that determine the family planning behaviors of young couples and their decisions related to childbearing	None
Sub-activity 11.2: Education and training for both quantitative and qualitative surveys	None
Sub-activity 11.3: Surveys and interviews to understand the prevailing socio-cultural norms around family planning	None, if protocols for protection of human subjects are followed.
Sub-activity 11.4: Workshop	None
Sub-activity 11.5: Data sharing	None

PROJECT 12: ASSESSMENT AND COMPARISON OF RECOVERY OF BIODIVERSITY AND CARBON SEQUESTRATION IN PHILIPPINE MANGROVES AMONG NATURAL, REPLANTED AND NATURALLY RECOLONIZED MANGROVE STANDS

TABLE 3M. POTENTIAL IMPACTS – PROJECT 12

Sub-Activity	Potential environmental and social impacts
Sub-activity 12.1: Establish and compare ecosystem services in conserved vs. restored mangroves	<ul style="list-style-type: none"> • Sampling of sediment and vegetation will be conducted in regions known for high mangrove plant and faunal biodiversity and in proximity to a UNESCO Biosphere Reserve. • Potential impacts from research in ecologically sensitive and protected areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation, camping ground disturbance, and from use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.). • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna. • Soil sampling for scientific studies and professional activities increases soil loss, because the samples—especially if in excessive amounts—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale, sampling may increase the erosion rates of the natural and other human-induced processes. • Creating contamination pathways to water sources, introducing contaminants into previously uncontaminated

	strata, uncontrolled run-off water, and inappropriate disposal of waste spoil.
Sub-activity 12.2: Develop/train researchers in the assessment of C sequestration, C stocks, C burial, and biodiversity in conserved vs. restored mangroves	None
Sub-activity 12.3: Community engagement	None
Sub-activity 12.4: Develop policy briefs and programs for more effective mangrove restoration	None

PROJECT 13: ASSESSMENT OF THE RESILIENCE OF LOCAL BALADI GOAT IN LEBANON: A VIABLE SUSTAINABLE SOLUTION TO A CHANGING CLIMATE IN A TRANSHUMANT SYSTEM

TABLE 3N. POTENTIAL IMPACTS – PROJECT 13

Sub-Activity	Potential environmental and social impacts
Sub-activity 13.1: Literature Review for background data	None
Sub-activity 13.2: Climate Data collection	None
Sub-activity 13.3: Parasite Analysis through fecal samples	<ul style="list-style-type: none"> None, if protocols for management and disposal of fecal samples are followed.
Sub-activity 13.4: Genotyping and GWAS analysis through blood samples	<ul style="list-style-type: none"> None, if protocols for management and disposal of blood samples are followed.
Sub-activity 13.5: Data analysis of milk production, kid growth, DOE BW, BCS and parasite prevalence	None
Sub-activity 13.6: Data sharing, capacity building and training	None

PROJECT 14: 'BIODIVERSITY CORRELATES OF SUSTAINABLE VALUE CHAIN EXPANSION IN THE BRAZILIAN AMAZON: DEVELOPING COMBINED ENVIRONMENTAL DNA (eDNA) AND CAMERA TRAPPING PROTOCOLS TO ASSESS VERTEBRATE DIVERSITY IN MANAGED BRAZIL NUT FORESTS'

TABLE 3O. POTENTIAL IMPACTS – PROJECT 14

Sub-Activity	Potential environmental and social impacts
Sub-activity 14.1: Work with community to identify survey sites one inhabited, multiple use protected area (Extractive Reserve), and one uninhabited, strict protection area (Ecological Station)	None
Sub-activity 14.2: Training of parabiologists from the local community	None
Sub-activity 14.3: Survey and describe the vertebrate fauna using camera trapping, transect-based surveys, and environmental DNA	<ul style="list-style-type: none"> Potential impacts from research in ecologically sensitive and protected areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation, camping ground disturbance, and from

(eDNA), and invertebrate-derived DNA (iDNA) samples.	<p>use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.).</p> <ul style="list-style-type: none"> Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna.
Sub-activity 14.4: Workshops and conferences	None
Sub-activity 14.5: Develop a research framework for the issue and stimulate a larger research program	None

PROJECT 15: INCLUSIVE ECONOMIC GROWTH FOR SUSTAINABLE PEACE? ASSESSING DEVELOPMENT MECHANISMS AND CONSERVATION EFFORTS IN POST-CONFLICT COLOMBIA

TABLE 3P. POTENTIAL IMPACTS – PROJECT 15

Sub-Activity	Potential environmental and social impacts
Sub-activity 15.1: Identifying the characteristics associated with inclusive, rural development, reduced violence, and social wellbeing, especially for vulnerable populations including Afro-Colombians, indigenous populations, and women	None
Sub-activity 15.2: Assessing the effects that development programs have on the environment	None
Sub-activity 15.3: Engage stakeholders to assess effects of development programs, share research, and shape practices and policies	None
Sub-activity 15.4: Disseminate findings	None

PROJECT 16: ASSESSMENT OF GEOTHERMAL ENERGY RESOURCES AND NATURAL HAZARDS IN ARMENIA

TABLE 3Q. POTENTIAL IMPACTS – PROJECT 16

Sub-Activity	Potential environmental and social impacts
Sub-activity 16.1: Develop extended, volcanological, geophysical, geochemical and borehole GIS database to summarize all existing information associated with geothermal energy potential	None
Sub-activity 16.2: Apply geochemical, volcanological, volcano-tectonic and geophysical research and application of innovative satellite methods to study promising areas for exploration of geothermal energy resources	None
Sub-activity 16.3: Train volcanologists	<ul style="list-style-type: none"> Potential impacts from research in ecologically sensitive

and seismologists to advance systematic studies of potential natural hazards and risks and geothermal resources by using new investigation approaches and methods	<p>and protected areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation, camping ground disturbance, and from use of scientific equipment</p> <ul style="list-style-type: none"> • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna. • Field work could involve risks to health and safety of field scientists
Sub-activity 16.4: Develop recommendations regarding further exploration and use of geothermal energy resources	<ul style="list-style-type: none"> • Policy guidance and recommendations on geothermal exploitation can have significant indirect impacts if the totality of potential environmental and social impacts is not taken into consideration.
Sub-activity 16.5: Collaborate on studies to improve knowledge of geological hazards and facilitate commercialization of research results	None

PROJECT 17: IMPROVING HUMAN LIVELIHOODS THROUGH HOLISTIC CONSERVATION OF MALAGASY ORPHANED PLANTS, THE ICONIC BAOBAB TREES

TABLE 3R. POTENTIAL IMPACTS – PROJECT 17

Sub-Activity	Potential environmental and social impacts
Sub-activity 17.1: Fieldwork to investigate the extent animals interacting with baobab fruits	<ul style="list-style-type: none"> • Potential impacts from research in ecologically sensitive and protected areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation, camping ground disturbance, and from use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.). • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna.
Sub-activity 17.2: Fieldwork to determine the role of extent animals in seed dispersal services of baobab trees	None
Sub-activity 17.3: Activities to develop nurseries, training and habitat restoration	<ul style="list-style-type: none"> • <u>Water use</u>: Poor water management and overuse of water increases pressure on water resources. • <u>Water pollution</u>: Nutrient run-off is primary concern because of the potential to contaminate groundwater and rivers. Nursery run-off water is a mixture of drainage water from pots (leachate), run-off from between pots, and from paths roads and other areas. Leachate poses a particular problem, while other potential contaminants include pesticides, wetting agents and oil from vehicles and machinery. • <u>Inputs</u>: Certain inputs can generate potentially significant environmental impacts, particularly fertilizers and pesticides. • <u>Soil disturbance</u>: The soils to use in raising of the tree nursery stock will need to be sourced somewhere resulting in localized soil disturbance. In addition, land preparation

	<p>and digging of planting holes will also cause soil disturbance.</p> <ul style="list-style-type: none"> • <u>Energy use</u>: Energy use represents a significant cost for many businesses, particularly for water pumping. All energy sources have some impact on our environment. • <u>Air pollution</u>: Nurseries may generate various forms of air pollution which can pose a health hazard or nuisance problem (e.g., dispersion of pesticide mist). • <u>Waste and wastewater</u>: Nurseries generate various organic and inorganic wastes that if not managed appropriately can cause environmental risks. Wastewater, if not managed appropriately, can cause environmental pollution, attract vectors, and spread disease.
Sub-activity 17.4: Activities to establish the baobab fruit trade for 90 households	None
Sub-activity 17.5: Activities to develop principles and recommendations to best practice of baobab sustainable exploitation & conservation	None

PROJECT 18: MULTI-SCALE, INTERDISCIPLINARY INTEGRATED ANALYSIS OF SOCIETAL AND ECOSYSTEM VALUES OF PERUVIAN AMAZON PEATLANDS

TABLE 3S. POTENTIAL IMPACTS – PROJECT 18

Sub-Activity	Potential environmental and social impacts
Sub-activity 18.1: Build ground-validated high-resolution maps of peatland location and extent in the understudied area of the Ucayali river	None
Sub-activity 18.2: Carry out training workshops on social and ecological research in the city of Pucallpa	None
Sub-activity 18.3: Measure biomass stocks in trees and soils in areas where peatlands are not yet quantified	<ul style="list-style-type: none"> • Potential impacts from research in ecologically sensitive and protected areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation, camping ground disturbance, and from use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.). • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna. • Soil sampling for scientific studies and professional activities increases soil loss, because the samples—especially if in excessive amount—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale,

	<p>sampling may increase the erosion rates of the natural and other human-induced processes.</p> <ul style="list-style-type: none"> • Creating contamination pathways to groundwater, introducing contaminants into previously uncontaminated strata, uncontrolled run-off water, and inappropriate disposal of waste spoil.
Sub-activity 18.4: Using participatory social science methods, co-develop a dynamic peatlands territorial-political map of local populations and their multi-scale socio-economic activities	None
Sub-activity 18.5: Compile socio-economic information from various sources including local municipalities, regional governments, the national government, international organizations, local accounts, and scholarly publications	None
Sub-activity 18.6: Co-create a repeatable social ecological 'nexus' research framework	None
Sub-activity 18.7: Integrate geographical distribution, ecological, and socioeconomic information into geographical information systems for public access	None

PROJECT 19: CREATING KNOWLEDGE ON COCOA POLLINATORS IN AGROFORESTRY SYSTEMS OF THE DOMINICAN REPUBLIC FOR IMPROVING PLANTATION MANAGEMENT PRACTICES

TABLE 3T. POTENTIAL IMPACTS – PROJECT 19

Sub-Activity	Potential environmental and social impacts
Sub-activity 19.1: Landscape analysis to identify a gradient, from highly forested to not forested, regarding the ecosystems surrounding cocoa plantations in each region	None
Sub-activity 19.2: Characterization of cocoa farmers' practices from a sample of 90 cocoa farmers selected in three contrasted cocoa production areas along the landscape gradient	<ul style="list-style-type: none"> • Potential impacts from research in ecologically sensitive areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation and from use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.) and exposure to emerging infectious diseases. • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna.
Sub-activity 19.3: Characterization of habitats for cocoa pollinator's communities	None
Sub-activity 19.4: Identification of insect communities	None
Sub-activity 19.5: Assessment of pollination efficiency among taxa followed by pollination rate assessment in laboratory and	None

pollination efficiency assessment in the field	
Sub-activity 19.6: Evaluation of the trade-offs between farmer's practices and surrounding ecosystems	None
Sub-activity 19.7: Capacity building for local technicians, researchers, cocoa farmers, and their families	None

PROJECT 20: PHYTOCHEMICAL, BIOLOGICAL AND TOXICOLOGICAL EVALUATION OF HOP (*HUMULUS LUPULUS* L.) FROM POPULATIONS GROWING WILD IN KOSOVO

TABLE 3U. POTENTIAL IMPACTS – PROJECT 20

Sub-Activity	Potential environmental and social impacts
Sub-activity 20.1: Review of the relevant literature and collection of plant materials	<ul style="list-style-type: none"> Vegetation sampling for scientific studies and professional activities can disturb ecosystems if extracted in an excessive amount. This sampling does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when vegetation is removed repeatedly on a large spatial scale, sampling may increase rates of biodiversity loss.
Sub-activity 20.2: DNA analyses of Hops collected from different wild populations.	<ul style="list-style-type: none"> Improper storage of hazardous chemicals can lead to accidental air, soil, and water pollution and risks to human health and safety. Improper management and disposal of hazardous waste can lead to disease transmission; air, soil and water pollution; and risks to human health and safety.
Sub-activity 20.3: Extraction and analysis of volatile and non-volatile organic compounds	<ul style="list-style-type: none"> Same as Sub-activity 20.2
Sub-activity 20.4: Evaluation of plant extracts toxicity	<ul style="list-style-type: none"> Same as Sub-activity 20.2
Sub-activity 20.5: Training, capacity building, and publications.	<ul style="list-style-type: none"> None

PROJECT 21: SOLAR DRYER INTEGRATED WITH ENERGY STORAGE SYSTEM: AN ENERGY EFFICIENT AND ENVIRONMENTALLY FRIENDLY TECHNOLOGY FOR DRYING BIOMATERIALS IN TANZANIA

TABLE 3U. POTENTIAL IMPACTS – PROJECT 21

Sub-Activity	Potential environmental and social impacts
Sub-activity 21.1: Preparation and characterization of thermal energy-storage materials (rocks)	<ul style="list-style-type: none"> Rocks sourced from environmentally sensitive or protected areas could contribute to loss of natural habitat. Improper sourcing of rocks could contribute to negative impacts on ecosystem services in the area. The crushing of rocks used for thermal storage can be sources of noise and vibration emissions. Occupational and public health and safety hazards can exist during processing of aggregates.
Sub-activity 21.2: Construction of a solar cabinet dryer prototype	<ul style="list-style-type: none"> If adequate open space is not available, construction of the solar dryer could potentially lead to the removal of vegetation and trees.

	<ul style="list-style-type: none"> • Potential impacts from point source pollution include general and hazardous construction waste as well as electronic waste. • Potential occupational health and/or safety hazards due to construction debris and during installation of solar technologies. • Accidental leaks/spills of paints can be sources of pollution.
Sub-activity 21.3: In-situ experimental and theoretical performance analysis of the developed dryer	<ul style="list-style-type: none"> • Food processing will likely result in the generation of organic wastes that must be handled appropriately. Additionally, spoiled products may need to be disposed of. • Sourcing and production of PV panels can involve destructive mining practices and energy-intensive production involving hazardous materials. • High value technology can be a target for theft. • The improper use, storage, and disposal of batteries, if used, can lead to soil, groundwater, and surface water contamination.
Sub-activity 21.4: Quality assessment and chemical analysis of the dried products	<ul style="list-style-type: none"> • Potential impacts of laboratory analyses are mostly those associated with related facilities such as generation of liquid and solid waste, use of hazardous chemicals, emissions, and consumption of water and energy. • Potential occupational health and safety hazards also exist for those working in laboratories or related facilities.
Sub-activity 21.5: Economic evaluation of the developed system	<ul style="list-style-type: none"> • None

PROJECT 22: IMPROVING SUSTAINABILITY AND RESILIENCE OF PERUVIAN AMAZON SYSTEMS THROUGH SILVOPASTORALISM

TABLE 3W. POTENTIAL IMPACTS – PROJECT 22

Sub-Activity	Potential environmental and social impacts
Sub-activity 22.1: Perform a holistic assessment of sustainability and resilience of silvopastoral systems compared with conventional pasture-based systems	<ul style="list-style-type: none"> • Potential impacts from research in ecologically sensitive areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation and from use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.). • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna.
Sub-activity 22.2: Strengthen students' capacities in sustainability assessment and livestock production systems in tropical regions	None
Sub-activity 22.3: Recommend strategies for sustainable and resilient livestock production in the Amazon to stakeholders including producers, policy makers, and industry leaders	None
Sub-activity 22.4: Estimate carbon	<ul style="list-style-type: none"> • Soil sampling for scientific studies and professional activities

storage potential of silvopastoral systems compared with conventional pasture-based systems	<p>increases soil loss, because the samples—especially if in excessive amount—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale, sampling may increase the erosion rates of the natural and other human-induced processes.</p> <ul style="list-style-type: none"> • Creating contamination pathways to groundwater, introducing contaminants into previously uncontaminated strata, uncontrolled run-off water, and inappropriate disposal of waste spoil.
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PROJECT 23: AGRIVOLTAIC TECHNOLOGY IN DRYLANDS OF WEST AFRICA: STRENGTHENING NATIONAL INNOVATION SYSTEMS FOR DIFFUSION AND MARKET DEVELOPMENT AT THE WATER-ENERGY-FOOD NEXUS

TABLE 3X. POTENTIAL IMPACTS – PROJECT 23

Sub-Activity	Potential environmental and social impacts
Sub-activity 23.1: Design and construct pilot agrivoltaic systems with a solar-powered drip irrigation system for concurrent renewable energy and food production in two climatic zones of Ghana: tropical rainforests and tropical savanna.	<ul style="list-style-type: none"> • Sourcing and production of PV panels can involve destructive mining practices and energy-intensive production involving hazardous materials • Depletion of freshwater resources from unsustainable water extraction • Habitat degradation from poor construction or agricultural practices • High value technology can be a target for theft
Sub-activity 23.2: Evaluate the potential impacts of the pilot systems for improved renewable energy generation, irrigation water management and food production.	<ul style="list-style-type: none"> • Water pollution from runoff of agricultural inputs • Transmission of vector-borne diseases from stagnant water at water points
Sub-activity 23.3: Evaluate the potential socioeconomic and environmental impacts of the pilot system in selected districts of Ghana.	None
Sub-activity 23.4: Disseminate the results and establish an appropriate transition arena of key stakeholders.	<ul style="list-style-type: none"> • Scaling up agrivoltaic systems could have disproportionate and cumulative impacts on the environment.

PROJECT 24: CLIMATE MITIGATION POTENTIAL OF COLOMBIA’S LOWLAND PEATLANDS: DISTRIBUTION, EMISSION FACTORS AND CONSERVATION PRIORITIES

TABLE 3Y. POTENTIAL IMPACTS – PROJECT 24

Sub-Activity	Potential environmental and social impacts
Sub-activity 24.1 Develop a high-resolution map of peatland distribution, peat depth, and carbon stocks of peatlands in the Colombian Amazon	None
Sub-activity 24.2 Ground-truthing to validate peatland map through peat sampling, observation, and analysis	<ul style="list-style-type: none"> • Potential impacts from research in ecologically sensitive and protected areas, especially in remote areas, can include both long- and short-term physical damage, such as track

Sub-activity 24.3 Quantify the main factors associated with changes in soil GHG emissions and peat accumulation rate from Amazonian peatlands under different disturbance regimes (forest degradation and deforestation).	<p>formation, camping ground disturbance, and from use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.).</p> <ul style="list-style-type: none"> • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna. • Soil sampling for scientific studies and professional activities increases soil loss, because the samples—especially if in excessive amounts—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale, sampling may increase the erosion rates of the natural and other human-induced processes. • Creating contamination pathways to groundwater, introducing contaminants into previously uncontaminated strata, uncontrolled run-off water, and inappropriate disposal of waste spoil.
Sub-activity 24.4 Develop mapping and monitoring protocols that are compatible with the forest monitoring and the national inventory programs.	None
Sub-activity 24.5 Cross-training and building local analytical capabilities	None

PROJECT 25: ENHANCING CAPACITY OF LOCAL COMMUNITIES IN LAIKIPIA COUNTY, KENYA: INCREASING PREPAREDNESS AND RESPONSE TO EMERGING INFECTIOUS DISEASES IN PARALLEL WITH PRESERVATION OF BIODIVERSITY

TABLE 3Z. POTENTIAL IMPACTS – PROJECT 25

Sub-Activity	Potential environmental and social impacts
Sub-activity 25.1: Conduct a sociological study using questionnaires and observation studies to complement and further explore the cultural practices associated with Emerging Infectious Diseases (EIDs)	None
Sub-activity 25.2: Sensitize pastoral communities on EIDs presence and how to minimize risk through a series of workshops and development of training materials	None
Sub-activity 25.3: Demonstrate ecological importance of EID vectors and reservoirs to promote conservation and protection of species	None
Sub-activity 25.4: Surveying important areas for conservation of relevant species and developing methods to assess their numbers with community members	None
Sub-activity 25.5: Quantitative analysis of the behavioral questionnaire responses using R	None

PROJECT 26: THE EFFECTS OF EXCESSIVE WATER USE AND AGRICULTURAL INTENSIFICATION ON ARAL SEA SHRINKAGE: SES DYNAMICS WITHIN THE SYR DARYA RIVER BASIN

TABLE 3AA. POTENTIAL IMPACTS – PROJECT 26

Sub-Activity	Potential environmental and social impacts
Sub-activity 26.1: Construction of a comprehensive database of social, economic, climate, soil, vegetation, and hydrology features, including installation of microclimatic stations and sampling along transects.	<ul style="list-style-type: none"> • Potential impacts from research in ecologically sensitive areas, especially in remote areas, can include both long- and short-term physical damage, such as track formation and from use of scientific equipment (e.g., flagging, tree markers, plot markers, trail markers, monitoring devices, etc.). • Soil sampling for scientific studies and professional activities increases soil loss, because the samples—especially if in excessive amounts—are often not restored to the original place. This erosion form does not usually heavily impact the environment, because of its limited spatial and temporal extent. However, when the soil is removed repeatedly on a large spatial scale, sampling may increase the erosion rates of the natural and other human-induced processes. • Potential impacts from point source pollution include the use of vehicles, accidents, personal trash, and waste, while many scientific research activities inevitably disturb the flora or fauna. • Creating contamination pathways to groundwater, introducing contaminants into previously uncontaminated strata, uncontrolled run-off water, and inappropriate disposal of waste spoil.
Sub-activity 26.2: Explore the interdependent changes of food, energy, and water for the three districts with high-resolution data for mechanistic understanding of coupled changes between climate and land use.	None
Sub-activity 26.3: Identify critical drivers (including policy shifts) on stream flows and ET loss through data analysis and the installation of three WMO standard microclimatic stations.	None
Sub-activity 26.4: Develop an open-access webpage to share all data and research findings publicly.	None
Sub-activity 26.5: Build capacity and knowledge to understand physical and socioeconomic changes.	None

PROJECT 27: RENEWABLE HYDROGEN GENERATION WITH CARBON RECYCLING (ReHyCaRe) FROM BIOGENIC RESIDUES OF BANGLADESH

TABLE 3BB. POTENTIAL IMPACTS – PROJECT 27

Sub-Activity	Potential environmental and social impacts
Sub-activity 27.1 Lifecycle	None

assessment of environmental impacts of biogas cleaning, CaDRe, and bio-slurry management	
Sub-activity 27.2 Scoping study, feedstock characterization, and pre-treatment of feedstock.	<ul style="list-style-type: none"> • Inappropriate management and disposal of sludge can result in disease transmission; air, soil and water pollution; and risks to human health and safety.
Sub-activity 27.3 Bench-scale experimental activity with anaerobic co-digestion of biogenic residues, biogas cleaning, and catalytic reforming of biogas for H ₂ production	<ul style="list-style-type: none"> • Fabrication and operation of biogas cleaning and catalytic reforming of biogas laboratory equipment (e.g., fixed-bed reactor and associated equipment including tubular vertical electric furnace) may result in the generation of wastes (e.g., spent biogas cleaning absorbents and catalyst from the reactor) and accidental (non-routine) events: spills and leaks which may include seepage from improperly protected storage location, surface discharge of liquid wastes, fuel spillage, and spills and leaks from container vehicles. • Inappropriate management and disposal of sludge can result in disease transmission; air, soil and water pollution; and risks to human health and safety. • Chemical inputs can emit pollutants into the atmosphere that impact both local and global air quality and climate stability. • Emissions of methane and carbon dioxide into the atmosphere, contributing to climate change.
Sub-activity 27.4 Techno-economic analysis of the integrated concept through building a process model	None
Sub-activity 27.5 Dissemination, management, reporting, capacity building, and progress meetings	None

PROJECT 28: WATER HARVESTING AT COMMUNITY LEVEL FOR ENHANCED ACCESS TO GROUND WATER

TABLE 3CC. POTENTIAL IMPACTS – PROJECT 28

Sub-Activity	Potential environmental and social impacts
Sub-activity 28.1: Collection of primary data related to water quantity, quality, and harvesting	<ul style="list-style-type: none"> • Over-extraction of well water if groundwater recharge rates and water use patterns are not closely monitored
Sub-activity 28.2: Development of integrated modeling system to assess the effects of rainwater harvesting	None
Sub-activity 28.3: Drilling of piezometric wells and establishment of percolation ponds to determine aquifer properties, soil characteristics, and to monitor the recharge efficiency of rainwater harvesting on groundwater level	<ul style="list-style-type: none"> • Inadequate planning, construction, and operation of wells and percolation pits can lead to depletion of water resources, habitat degradation, and increase in disease vectors due to standing water.
Sub-activity 28.4: Impact assessment of artificial recharge structures	None
Sub-activity 28.5: Raising awareness, training, and	<ul style="list-style-type: none"> • Significant environmental and social impacts can result if

dissemination of information	recommendations from this study do not take into account the totality of environmental and social impacts that can result from scale-up of groundwater extraction activities
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4.0 ENVIRONMENTAL DETERMINATIONS

4.1 RECOMMENDED ENVIRONMENTAL DETERMINATIONS

The following table summarizes the recommended determinations based on the environmental analysis conducted. Upon approval, these determinations become affirmed, per 22 CFR 216. Specified conditions, detailed in Section 5, become mandatory obligations of implementation, per ADS 204.

TABLE 4: ENVIRONMENTAL DETERMINATIONS

Projects/Activities	Categorical Exclusion Citation (if applicable)	Negative Determination	Positive Determination ⁶	Deferral ⁷
Project 1: Developing a framework for the identification of soil limiting factors for bioremediation of dioxin compounds in contaminated soils of Vietnam		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 2: Biochar Facilitated Bioremediation: A Green Solution for Dioxin/Furan Pollution		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 3: Nanoassisted bioremediation of diffused dioxins in soil and sediment		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 4: Community and Hospital-based Obstetrics WhatsApp Triage, Referral, and Transfer (WAT-RT) System		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 5: Bridging Higher Education and Practice: Addressing Gender Inequity in STEM and Sanitation in Malawi	216.2(c)(2)(i) 216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 6: Livelihood Change in the Context of Community Conservation	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 7: The evaluation of challenges of youth in Kazakhstan and piloting innovative solutions	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 8: Morogoro Youth Empowerment through	216.2(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

⁶ Positive Determinations require preparation of a Scoping Statement and Environmental Assessment.

⁷ Deferrals must be cleared through an Amendment to this IEE prior to implementation of any deferred activities.

Establishment of Social Innovation (YEESI) Lab for Problem-centered Training in Machine Vision				
Project 9: Long-term impacts of land-use/land-cover dynamics on surface water quality in Botswana's reservoirs using satellite data and artificial intelligence methods: case study of the Botswana's Limpopo River Basin		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 10: Engaging the private sector in increasing voluntary use of long-acting reversible contraceptives and permanent family planning methods in rural areas of Bangladesh		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 11: Young Wives: An Exploratory Study of Married Women Below Twenty and the Socio-Cultural Determinants of their Contraceptive Behavior in Low Resource Settings in India	216.2(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 12: Assessment and Comparison of Recovery of Biodiversity and Carbon Sequestration in Philippine Mangroves Among Natural, Replanted and Naturally recolonized Mangrove Stands		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 13: Assessment of the resilience of Local Baladi goat in Lebanon: a viable sustainable solution to a changing climate in a transhumant system		<input checked="" type="checkbox"/> <i>without</i> conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 14: 'Biodiversity correlates of sustainable value chain expansion in the Brazilian Amazon: Developing combined environmental DNA (eDNA) and camera trapping protocols to assess vertebrate diversity in managed Brazil nut forests.		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 15: Inclusive Economic Growth for Sustainable Peace? Assessing Development Mechanisms and Conservation Efforts in Post-Conflict Colombia	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 16: Assessment of Geothermal Energy Resources		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>

and Natural Hazards In Armenia				
Project 17: Improving human livelihoods through holistic conservation of Malagasy orphaned plants, the iconic Baobab trees		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 18: Multi-Scale, Interdisciplinary Integrated Analysis of Societal and Ecosystem Values of Peruvian Amazon Peatlands		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 19: Creating knowledge on cocoa pollinators in agroforestry systems of the Dominican Republic for improving plantation management practices		<input checked="" type="checkbox"/> with conditions.	<input type="checkbox"/>	<input type="checkbox"/>
Project 20: Phytochemical, biological and toxicological evaluation of hop (<i>Humulus lupulus</i> L.) from populations growing wild in Kosovo		<input checked="" type="checkbox"/> With conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 21: Solar dryer integrated with energy storage system: An energy efficient and environmentally friendly technology for drying biomaterials in Tanzania		<input checked="" type="checkbox"/> With conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 22: Improving sustainability and resilience of Peruvian Amazon systems through silvopastoralism		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 23: Agrivoltaic Technology in Drylands of West Africa: Strengthening National Innovation Systems for Diffusion and Market Development at the Water-Energy-Food Nexus		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 24: Climate mitigation potential of Colombia's lowland peatlands: distribution, emission factors and conservation priorities		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 25: Enhancing capacity of local communities in Laikipia County, Kenya: increasing preparedness and response to emerging infectious diseases in parallel with preservation of biodiversity	216.2(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project 26: The Effects of Excessive Water Use and		<input checked="" type="checkbox"/> With conditions	<input type="checkbox"/>	<input type="checkbox"/>

Agricultural Intensification on Aral Sea Shrinkage: SES Dynamics within the Syr Darya River Basin				
Project 27: Renewable Hydrogen Generation with Carbon Recycling (ReHyCaRe) from Biogenic Residues of Bangladesh		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>
Project 28: Water Harvesting at Community Level for Enhanced Access to Ground Water		<input checked="" type="checkbox"/> with conditions	<input type="checkbox"/>	<input type="checkbox"/>

4.2 CLIMATE RISK MANAGEMENT

Climate Risk Management (CRM) screening was conducted in consideration of the potential effect of climate risks/stressors on the sustainability of the project (changing precipitation patterns, rising temperature, floods, droughts, fires, landslides, etc.) in addition to the impact of project activities on the climate (increased greenhouse gas emissions, land use changes, etc.). See Annex 1 for the complete CRM table.

5.0 CONDITIONS AND MITIGATION MEASURES

5.1 CONDITIONS

The environmental determinations in this IEE are contingent upon full implementation of the following general implementation and monitoring requirements, as well as ADS 204 and other relevant requirements.

5.1.1 During Post-Award:

- 5.1.1.1 Workplans and Budgeting: The A/COR will ensure the IP integrates environmental compliance requirements in work plans and budgets to comply with requirements, including EMMP implementation and monitoring.
- 5.1.1.2 Staffing: The A/COR, in coordination with the IP, will ensure all awards have staffing capacity to implement environmental compliance requirements.
- 5.1.1.3 Records Management: The A/COR will maintain environmental compliance documents in the official project/activity file and upload records to the designated USAID environmental compliance database system.
- 5.1.1.4 Host Country Environmental Compliance: The A/COR will ensure the IP complies with applicable and appropriate host country environmental requirements unless otherwise directed in writing by USAID. However, in the case of a conflict between the host country and USAID requirements, the more stringent shall govern.
- 5.1.1.5 Work Plan Review: The A/COR will ensure the IP verifies, at least annually or when activities are added or modified, that activities remain within the scope of the

IEE. Activities outside of the scope of the IEE cannot be implemented until the IEE is amended.

- 5.1.1.6 IEE Amendment: If new activities are introduced or other changes to the scope of this IEE occur, an IEE Amendment will be required.
- 5.1.1.7 USAID Monitoring Oversight: The A/COR or designee, with the support of the cognizant environmental officer(s) (e.g., MEO, REA, BEO), will ensure monitoring of compliance with established requirements (e.g., by desktop reviews, site visits, etc.).
- 5.1.1.8 Environmental Compliance Mitigation and Monitoring Plan: For all activities that received a Negative Determination with Conditions, the A/COR will ensure the IP develops, obtains approval for, and implements Environmental Mitigation and Monitoring Plans (EMMPs) that are responsive to the stipulated environmental compliance requirements.
- 5.1.1.9 Environmental Compliance Reporting: The A/COR will ensure the IP includes environmental compliance in regular project/activity reports, using indicators as appropriate; develops and submits the Environmental Mitigation and Monitoring Reports (EMMRs); and completes and submits a Record of Compliance (RoC) describing their implementation of EMMP requirements in conjunction with the final EMMR or at the close of sub activities (as applicable). And where required by Bureaus or Missions, ensure the IP prepares a closeout plan consistent with contract documentation for A/COR review and approval that outlines responsibilities for end-of-project operation, the transition of other operational responsibilities, and final EMMR with lessons learned.
- 5.1.1.10 Corrective Action: When noncompliance or unforeseen impacts are identified, IPs notify the A/COR, place a hold on activities, take corrective action, and report on the effectiveness of corrective actions. The A/COR initiates the corrective action process and ensures the IP completes and documents their activities. Where required by Bureaus or Missions, ensure Record of Compliance is completed.

5.2 AGENCY CONDITIONS

- 5.2.1 Sub-award Screening: The A/COR will ensure the IP uses an adequate environmental screening tool to screen any sub-award applications and to aid in the development of EMMPs.
- 5.2.2 Compliance with human subject research requirements: The AM, A/COR shall assure that the IP and sub-awardees, -grantees, and -contractors demonstrate completion of all requirements for ethics review and adequate medical monitoring of human subjects who participate in research trials carried out through this IEE and ensure appropriate records are maintained. All documentation demonstrating completion of required review and approval of human subject trials must be in place prior to initiating any trials and cover the period of performance of the trial as described in the research protocol.

5.3 MITIGATION MEASURES

The mitigation measures presented in this section constitute the minimum required based on available information at the time of this IEE and the environmental analysis in Section 4. These measures shall provide general direction for completing the project Environmental Mitigation and Monitoring Plan (EMMP) for all projects that received a Negative Determination with Conditions.

PROJECT 1: DEVELOPING A FRAMEWORK FOR THE IDENTIFICATION OF SOIL LIMITING FACTORS FOR BIOREMEDIATION OF DIOXIN COMPOUNDS IN CONTAMINATED SOILS OF VIETNAM

TABLE 5A. SUMMARY OF MITIGATION MEASURES FOR PROJECT 1

Sub-Activity	Mitigation Measure(s)
Sub-activity 1.1: Survey (21 soil samples) of residual concentration of aged dioxin compound in air base soils	<ul style="list-style-type: none">● Safety working protocols will be established and implemented, including:<ul style="list-style-type: none">○ All members of the research team will attend a training regarding the hazardous and toxic natures of dioxin for humans, animals, ecology, and environment before starting this project. Training should address the importance of, and proper use of, PPE.○ Require use of international standard PPE for all field staff. PPE required should be designed and sized appropriately as well as for the tropical climate.○ Obtain relevant waste disposal permits from the appropriate authorities.○ Prepare a Waste Management Plan approved by project supervisor based on current best practice.○ All project personnel will be required to follow safeguarding, handling, cleaning, decontaminating, and waste management procedures for working with dioxin in the lab and the field.○ A separate lab room with restricted access for contaminated soils research will be organized. Only authorized and properly trained personnel will have access.○ Dioxin-containing wastes will be segregated for proper disposal and treatment in the hazardous waste treatment facility of Can Tho City, Vietnam.○ The inspector group of the technical safety testing center of Can Tho city will visit the lab to inspect operation and activities and contamination records on a monthly basis.○ A control sheet will be used to record and document the daily input and output amounts of dioxin contaminated soil in the lab.○ The project will undertake routine daily cleaning to ensure containment of any spilled contaminated soil, along with the maintenance and repair of any equipment used in processing

	<ul style="list-style-type: none"> and handling contaminated soil. ○ A hotline will be provided for reporting and notification of the theft, loss, or release of any contaminated soil. ○ A lab safety manager will be hired to ensure that all protocols are followed, and records maintained. ● Recommended Guidance: USAID Sector Environmental Guideline for Solid Waste: Environmental Assessment of Dioxin Contamination at Bien Hoa Airbase.
Sub-activity 1.2: Soil property analysis	None
Sub-activity 1.3: Isolation and screening of biosurfactant producing bacteria	None
Sub-activity 1.4: Isolation and characterization of dibenzofuran (DF) degrading bacteria	None
Sub-activity 1.5: Bioremediation experiments in microcosms (lab)	None
Sub-activity 1.6: Testing lab bioremediation treatments at field sites	<ul style="list-style-type: none"> ● See Sub-activity 1.1 above
Sub-activity 1.7: Continued sampling/testing for results	<ul style="list-style-type: none"> ● See Sub-activity 1.1 above

PROJECT 2: BIOCHAR FACILITATED BIOREMEDIATION: A GREEN SOLUTION FOR DIOXIN/FURAN POLLUTION

TABLE 5B. SUMMARY OF MITIGATION MEASURES FOR PROJECT 2

Sub-Activity	Mitigation Measure(s)
Sub-activity 2.1: Obtain and prepare biochar feedstocks.	<ul style="list-style-type: none"> ● Evaluation of emissions resulting from different biochars' preparation ● Optimization of pyrolysis conditions to minimize emissions
Sub-activity 2.2: Elemental analysis of biochars and feedstocks	<ul style="list-style-type: none"> ● If not planned, consider testing biochar for D/F prior to use in the study to establish a baseline concentration.
Sub-activity 2.3: Soil Samples from test site – containing agent orange 3	<ul style="list-style-type: none"> ● All members of the research team will be trained on the hazardous and toxic natures of dioxin for humans, animals, ecology, and environment before starting this project. Training should address the importance of, and proper use of, PPE. ● Require use of international standard PPE for all field staff. PPE required should be designed and sized appropriately as well as for the tropical climate. ● Obtain relevant waste disposal permits from the appropriate authorities. ● Prepare a Waste Management Plan approved by project supervisor based on current best practice. ● All project personnel will be required to follow safeguarding, handling, cleaning, decontaminating, and waste management procedures for working with dioxin in the lab and the field.

	<ul style="list-style-type: none"> • A separate area with restricted access for contaminated soils research will be organized. Only authorized and properly trained personnel will have access. • Dioxin-containing wastes will be segregated for proper disposal and treatment in an appropriate hazardous waste treatment facility. • Operations and activities and contamination records should be inspected at regular intervals. • Daily input and output amounts of dioxin contaminated soil in the lab should be documented. • The project will undertake routine daily cleaning to ensure containment of any spilled contaminated soil, along with the maintenance and repair of any equipment used in processing and handling contaminated soil. • Any theft, loss, or release of any contaminated soil will be reported to the relevant authority. • A responsible entity will ensure that all protocols are followed, and records maintained. • Recommended Guidance: USAID Sector Environmental Guideline for Solid Waste; Environmental Assessment of Dioxin Contamination at Bien Hoa Airbase.
Sub-activity 2.4: Testing sorptive capacity of biochars	<ul style="list-style-type: none"> • See Sub-activity 2.3 above
Sub-activity 2.5: Analysis of sorptive removal capacity of biochars	<ul style="list-style-type: none"> • See Sub-activity 2.3 above
Sub-activity 2.6: Development of online courses and videos on bioremediation, environmental microbiology, and environmental chemistry to build capacity of students.	None

PROJECT 3: NANO-ASSISTED BIOREMEDIATION OF DIFFUSED DIOXINS IN SOIL AND SEDIMENT

TABLE 5C. SUMMARY OF MITIGATION MEASURES FOR PROJECT 3

Sub-Activity	Mitigation Measure(s)
Sub-activity 3.1: Samples and enrichment	<ul style="list-style-type: none"> • All members of the research team will be trained on the hazardous and toxic natures of dioxin for humans, animals, ecology, and environment before starting this project; • Obtain relevant waste disposal permits from the appropriate authorities. • Prepare a Waste Management Plan approved by project supervisor based on current best practice. • All project personnel will be required to follow safeguarding, handling, cleaning, decontaminating, and waste management procedures for working with dioxin in the lab and the field. • A separate area with restricted access for contaminated soils research will be organized. Only authorized and properly trained personnel will have access.

	<ul style="list-style-type: none"> • Dioxin-containing wastes will be segregated for proper disposal and treatment in an appropriate hazardous waste treatment facility. • Operations and activities and contamination records should be inspected at regular intervals. • Daily input and output amounts of dioxin contaminated soil in the lab should be documented. • The project will undertake routine daily cleaning to ensure containment of any spilled contaminated soil, along with the maintenance and repair of any equipment used in processing and handling contaminated soil. • Any theft, loss, or release of any contaminated soil will be reported to the relevant authority. • A responsible entity will ensure that all protocols are followed, and records maintained. • NZVI particles will be coated with CMC to prevent toxic effects on indigenous microbes. • Recommended Guidance: USAID Sector Environmental Guideline for Solid Waste: Environmental Assessment of Dioxin Contamination at Bien Hoa Airbase.
Sub-activity 3.2: Lab experiments using anaerobic and aerobic digestion	<ul style="list-style-type: none"> • Same as Sub-activity 3.1 above
Sub-activity 3.3: Pilot scale onsite treatment using best results from experiment	<ul style="list-style-type: none"> • Same as Sub-activity 3.1 above
Sub-activity 3.4: Design of full-scale treatment	<ul style="list-style-type: none"> • Same as Sub-activity 3.1 above
Sub-activity 3.5: Disseminate results and provide capacity building for local	<ul style="list-style-type: none"> • None

PROJECT 4: COMMUNITY AND HOSPITAL-BASED OBSTETRICS WHATSAPP TRIAGE, REFERRAL, AND TRANSFER (WAT-RT) SYSTEM

TABLE 5D. SUMMARY OF MITIGATION MEASURES FOR PROJECT 4

Sub-Activity	Mitigation Measure(s)
Sub-activity 4.1: Participatory action research to identify health system challenges and learning needs assessment of WhatsApp	None
Sub-activity 4.2: Protocol design for WAT-RT	None
Sub-activity 4.3: Training of trainers on implementation of WAT-RT system at 40 clinics and 2 hospitals	<ul style="list-style-type: none"> • To the extent relevant and feasible, training should touch on the importance of following best practices for healthcare waste management and use of PPE as an element of risk assessment and triage. • Recommended Guidance: USAID Sector Environmental Guideline for Healthcare Waste
Sub-activity 4.4: Assessment of current OB triage protocols	None
Sub-activity 4.5: Interactive triage	<ul style="list-style-type: none"> • To the extent relevant and feasible, training should touch on

training for emergency and labor & delivery personnel at hospitals	the importance of following best practices for healthcare waste management and use of PPE as an element of risk assessment and triage. <ul style="list-style-type: none"> Recommended Guidance: USAID Sector Environmental Guideline for Healthcare Waste
Sub-activity 4.6: Monitoring and Evaluation	None

PROJECT 9: LONG-TERM IMPACTS OF LAND-USE/LAND-COVER DYNAMICS ON SURFACE WATER QUALITY IN BOTSWANA'S RESERVOIRS USING SATELLITE DATA AND ARTIFICIAL INTELLIGENCE METHODS: CASE STUDY OF THE BOTSWANA'S LIMPOPO RIVER BASIN

TABLE 5E. SUMMARY OF MITIGATION MEASURES FOR PROJECT 9

Sub-Activity	Mitigation Measure(s)
Sub-activity 9.1: Mapping and quantifying the spatio-temporal land-use and land-cover (LULC) patterns in the Limpopo River Basin (LRB) from 1984-2019 to create a forecasting model	None
Sub-activity 9.2: Quantify and analyze the correlation between water availability and the determinant water quality parameters in LRB	None
Sub-activity 9.3: Develop and compare different machine-learning AI models for the simulation and prediction of the trend impacts of LULU change on water quality and water availability	None
Sub-activity 9.4: Determine the significant water quality parameters in the reservoir water bodies and develop empirical models from the in site measurements and spectral reflectance analyses using UAV-borne spectrometer observations combined with satellite data for near-real-time estimation of reservoirs water quality	None
Sub-activity 9.5: Derive an empirical framework that interlinks and accounts for the interactions and relations between the land and water systems, and their inter-linkages with socio-economic development and climate change with potential impacts on rural and urban communities	<ul style="list-style-type: none"> Framework must include comprehensive consideration of potential environmental and social impacts of land use planning and changes, including: <ul style="list-style-type: none"> Considerations for upstream/downstream water usages to ensure indirect impacts are not borne by other users Ensure that sensitive ecosystems (and ecosystem services) are preserved, as well as habitats for threatened or endangered species

PROJECT 10: ENGAGING THE PRIVATE SECTOR IN INCREASING VOLUNTARY USE OF LONG-ACTING REVERSIBLE CONTRACEPTIVES AND PERMANENT FAMILY PLANNING METHODS IN RURAL AREAS OF BANGLADESH

TABLE 5F. SUMMARY OF MITIGATION MEASURES FOR PROJECT 10

Sub-Activity	Mitigation Measure(s)
Sub-activity 10.1: Develop messages and leaflets on pregnancy care	None
Sub-activity 10.2: Rapid program readiness assessment of private intervention clinics	None
Sub-activity 10.3: Identify and prepare list of pregnant women in the study areas	None
Sub-activity 10.4: Development of simple mobile phone-based messaging system	None
Sub-activity 10.5: SMS messaging of identified pregnant women to promote institutional delivery and post-partum family planning (PP-FP) after delivery	<ul style="list-style-type: none"> • Messaging and counseling must be designed with an awareness and understanding of sociocultural norms around family planning, contraceptives, and gender roles.
Sub-activity 10.6: Counseling of pregnant women in private clinics	<ul style="list-style-type: none"> • Same as Sub-activity 10.5
Sub-activity 10.7: Training on technical and ethical issues to private clinic staff involved in program services	<ul style="list-style-type: none"> • Training of staff must include best practices for healthcare waste management and safe disposal of healthcare commodities • As feasible, provision of support and guidance to health facilities to encourage improvements in healthcare waste management • Recommended Guidance: USAID Sector Environmental Guideline for Healthcare Waste
Sub-activity 10.8: Trainees provision of delivery care and PP-FP services as per choice of the mothers	
Sub-activity 10.9: Monitoring	None

PROJECT 12: ASSESSMENT AND COMPARISON OF RECOVERY OF BIODIVERSITY AND CARBON SEQUESTRATION IN PHILIPPINE MANGROVES AMONG NATURAL, REPLANTED AND NATURALLY RECOLONIZED MANGROVE STANDS

TABLE 5H. SUMMARY OF MITIGATION MEASURES FOR PROJECT 12

Sub-Activity	Mitigation Measure(s)
Sub-activity 12.1: Establish and compare ecosystem services in conserved vs. restored mangroves	<ul style="list-style-type: none"> • The project should demonstrate that the proposed activity in such areas is legally permitted • Comply with all environmental regulations set by the national government on sampling, storage, permits and shipments of samples • Act in a manner consistent with defined protected area management plans • Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed project • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take only the smallest samples necessary • Take special care when undertaking works in areas where plants and animals are protected • Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects.

	<p>Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on habitat.</p> <ul style="list-style-type: none"> • If groundwater is assessed to be sensitive in the site study, then steps must be taken to protect it during the works if there is potential for disturbance of the ground to affect groundwater quality. Steps to avoid contaminating groundwater include the use of appropriate bore techniques to isolate aquifers when drilling and restricting the depth of excavations if contaminants are present at or near the water table or are likely to be mobilized as a result of the intrusive investigations. • Take care to avoid spreading contamination into previously uncontaminated areas of the site. Controls on the movement of equipment and vehicles from contaminated to uncontaminated areas should be in place. During sampling work, contaminated spoil material should be handled appropriately.
Sub-activity 12.2: Develop/train researchers in the assessment of C sequestration, C stocks, C burial, and biodiversity in conserved vs. restored mangroves	None
Sub-activity 12.3: Community engagement	None
Sub-activity 12.4: Develop policy briefs and programs for more effective mangrove restoration	None

PROJECT 14: 'BIODIVERSITY CORRELATES OF SUSTAINABLE VALUE CHAIN EXPANSION IN THE BRAZILIAN AMAZON: DEVELOPING COMBINED ENVIRONMENTAL DNA (eDNA) AND CAMERA TRAPPING PROTOCOLS TO ASSESS VERTEBRATE DIVERSITY IN MANAGED BRAZIL NUT FORESTS'

TABLE 5I. SUMMARY OF MITIGATION MEASURES FOR PROJECT 14

Sub-Activity	Mitigation Measure(s)
Sub-activity 14.1: Work with community to identify survey sites one inhabited, multiple use protected area (Extractive Reserve), and one uninhabited, strict protection area (Ecological Station)	None
Sub-activity 14.2: Training of parabiologists from the local community	None
Sub-activity 14.3: Survey and describe the vertebrate fauna using camera trapping, transect-based surveys, and environmental DNA (eDNA), and invertebrate-derived DNA (iDNA) samples.	<ul style="list-style-type: none"> • The project should demonstrate that the proposed activity in such areas is legally permitted • Act in a manner consistent with defined protected area management plans • Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed

	<p>project</p> <ul style="list-style-type: none"> • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take only the smallest samples necessary • Take special care when undertaking works in areas where plants and animals are protected. • Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on habitat.
Sub-activity 14.4: Workshops and conferences	None
Sub-activity 14.5: Develop a research framework for the issue and stimulate a larger research program	None

PROJECT 16: ASSESSMENT OF GEOTHERMAL ENERGY RESOURCES AND NATURAL HAZARDS IN ARMENIA

TABLE 5J: SUMMARY OF MITIGATION MEASURES FOR PROJECT 16

Sub-Activity	Mitigation Measure(s)
Sub-activity 16.1: Develop extended, volcanological, geophysical, geochemical and borehole GIS database to summarize all existing information associated with geothermal energy potential	None
Sub-activity 16.2: Apply geochemical, volcanological, volcano-tectonic and geophysical research and application of innovative satellite methods to study promising areas for exploration of geothermal energy resources	None
Sub-activity 16.3: Train volcanologists and seismologists to advance systematic studies of potential natural hazards and risks and geothermal resources by using new investigation approaches and methods	<ul style="list-style-type: none"> • The project should demonstrate that the proposed activity in such areas is legally permitted • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take special care when undertaking works in areas where plants and animals are protected. • Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times, using investigation techniques with minimal disturbance, and relocating field work locations to areas with less impact on habitat. • Development of comprehensive field work safety plan to evaluate risks and minimize hazards.

Sub-activity 16.4: Develop recommendations regarding further exploration and use of geothermal energy resources	<ul style="list-style-type: none"> Recommendations on exploration and exploitation of geothermal energy resources must take into account the potential associated environmental and social risks, as outlined in the reference below. Recommended reference: USAID Sector Environmental Guideline for Small-scale Energy
Sub-activity 16.5: Collaborate on studies to improve knowledge of geological hazards and facilitate commercialization of research results	None

PROJECT 17: IMPROVING HUMAN LIVELIHOODS THROUGH HOLISTIC CONSERVATION OF MALAGASY ORPHANED PLANTS, THE ICONIC BAOBAB TREES

TABLE 5K. SUMMARY OF MITIGATION MEASURES FOR PROJECT 17

Sub-Activity	Mitigation Measure(s)
Sub-activity 17.1: Fieldwork to investigate the extent animals interacting with baobab fruits	<ul style="list-style-type: none"> Act in a manner consistent with defined protected area management plans. Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed project. Minimize new trails and follow footsteps Manage and dispose of waste properly Take special care when undertaking works in areas where plants and animals are protected. Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects.
Sub-activity 17.2: Fieldwork to determine the role of extent animals in seed dispersal services of baobab trees	None
Sub-activity 17.3: Activities to develop nurseries, training, and habitat restoration	<ul style="list-style-type: none"> Pesticide procurement, use, or support is <u>not permitted</u> without an approved Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) in place. Review and ensure compliance with legislation and voluntary initiatives <ul style="list-style-type: none"> Fertilizer regulations Water use regulations Undertake integrated pest management strategies Ensure that all staff are trained and aware of and follow instructions <u>Water use</u>: Water early in the morning and late afternoon Use watering cans and not hose pipes. Where practical and economical, use drip irrigation. Schedule irrigation based on environmental conditions rather than a simple timed schedule. These conditions include rainfall, humidity, wind, temperature and day length. <u>Inputs</u>: Mix and store chemicals and handle oils in covered, contained areas in order to prevent spills which may be

	<p>washed away. Cleanup spills immediately</p> <ul style="list-style-type: none"> • <u>Soil disturbance</u>: Ensure soil is sourced from areas where the risk of erosion and land degradation can be minimized. • <u>Energy use</u>: Use materials, energy and water more efficiently. • <u>Waste and wastewater</u>: Use licensed waste disposal agents • Recommended references: USAID Sector Environmental Guidelines for Integrated Pest Management and Crop Production
Sub-activity 17.4: Activities to establish the baobab fruit trade for 90 households	None
Sub-activity 17.5: Activities to develop principles and recommendations to best practice of baobab sustainable exploitation & conservation	None

PROJECT 18: MULTI-SCALE, INTERDISCIPLINARY INTEGRATED ANALYSIS OF SOCIETAL AND ECOSYSTEM VALUES OF PERUVIAN AMAZON PEATLANDS

TABLE 5L. SUMMARY OF MITIGATION MEASURES FOR PROJECT 18

Sub-Activity	Mitigation Measure(s)
Sub-activity 18.1: Build ground-validated high-resolution maps of peatland location and extent in the understudied area of the Ucayali river	None
Sub-activity 18.2: Carry out training workshops on social and ecological research in the city of Pucallpa	None
Sub-activity 18.3: Measure biomass stocks in trees and soils in areas where peatlands are not yet quantified	<ul style="list-style-type: none"> • The project should demonstrate that the proposed activity in such areas is legally permitted • Comply with all environmental regulations set by the national government on sampling, storage, permits and shipments of samples. • Act in a manner consistent with defined protected area management plans • Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed project • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take only the smallest samples necessary • Take special care when undertaking works in areas where plants and animals are protected. • Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on

	<p>habitat.</p> <ul style="list-style-type: none"> • If groundwater is assessed to be sensitive in the site study, then steps must be taken to protect it during the works if there is potential for disturbance of the ground to affect groundwater quality. Steps to avoid contaminating groundwater include the use of appropriate bore techniques to isolate aquifers when drilling and restricting the depth of excavations if contaminants are present at or near the water table, or are likely to be mobilized as a result of the intrusive investigations. • Take care to avoid spreading contamination into previously uncontaminated areas of the site. Controls on the movement of equipment and vehicles from contaminated to uncontaminated areas should be in place. During sampling work, contaminated spoil material should be handled appropriately.
Sub-activity 18.4: Using participatory social science methods, co-develop a dynamic peatlands territorial-political map of local populations and their multi-scale socio-economic activities	None
Sub-activity 18.5: Compile socio-economic information from various sources including local municipalities, regional governments, the national government, international organizations, local accounts, and scholarly publications	None
Sub-activity 18.6: Co-create a repeatable social ecological 'nexus' research framework	None
Sub-activity 18.7: Integrate geographical distribution, ecological, and socioeconomic information into geographical information systems for public access	None

PROJECT 19: CREATING KNOWLEDGE ON COCOA POLLINATORS IN AGROFORESTRY SYSTEMS OF THE DOMINICAN REPUBLIC FOR IMPROVING PLANTATION MANAGEMENT PRACTICES

TABLE 5M. SUMMARY OF MITIGATION MEASURES FOR PROJECT 19

Sub-Activity	Mitigation Measure(s)
Sub-activity 19.1: Landscape analysis to identify a gradient, from highly forested to not forested, regarding the ecosystems surrounding cocoa plantations in each region	None
Sub-activity 19.2: Characterization of cocoa farmers' practices from a	<ul style="list-style-type: none"> • The project should ensure that the proposed activity in such

sample of 90 cocoa farmers selected in three contrasted cocoa production areas along the landscape gradient	<p>areas is explained to and permitted by landholders and cocoa farmers</p> <ul style="list-style-type: none"> • Consult local communities and other key stakeholders on the proposed project • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take only the smallest samples necessary • Take special care when undertaking works in areas where plants and animals are protected. • Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on habitat.
Sub-activity 19.3: Characterization of habitats for cocoa pollinator's communities	None
Sub-activity 19.4: Identification of insect communities	None
Sub-activity 19.5: Assessment of pollination efficiency among taxa followed by pollination rate assessment in laboratory and pollination efficiency assessment in the field	None
Sub-activity 19.6: Evaluation of the trade-offs between farmer's practices and surrounding ecosystems	None
Sub-activity 19.7: Capacity building for local technicians, researchers, cocoa farmers, and their families	None

PROJECT 20: PHYTOCHEMICAL, BIOLOGICAL AND TOXICOLOGICAL EVALUATION OF HOP (*HUMULUS LUPULUS L.*) FROM POPULATIONS GROWING WILD IN KOSOVO

TABLE 5N. SUMMARY OF MITIGATION MEASURES FOR PROJECT 20

Sub-Activity	Mitigation Measure(s)
Sub-activity 20.1: Review of the relevant literature and collection of plant materials	<ul style="list-style-type: none"> • The project should demonstrate that the proposed activity in such areas is legally permitted • Comply with all environmental regulations set by the national government on sampling, storage, permits and shipments of samples. • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take only the smallest samples necessary • Take special care when undertaking works in areas where plants and animals are protected. • Identify the effects of the site activity and undertake

	<p>appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on habitat.</p> <ul style="list-style-type: none"> • Take care to avoid spreading contamination into previously uncontaminated areas of the site. Controls on the movement of equipment and vehicles from contaminated to uncontaminated areas should be in place. During sampling work, contaminated spoil material should be handled appropriately.
Sub-activity 20.2: DNA analyses of Hops collected from different wild populations.	<ul style="list-style-type: none"> • All project personnel will be required to follow safeguarding, handling, cleaning, decontaminating, and waste management procedures for working with hazardous chemicals in the lab. • Hazardous wastes will be segregated for proper disposal and treatment in an appropriate hazardous waste treatment facility. • The project will undertake routine daily cleaning to ensure containment of any spilled chemicals used in analysis. • A responsible entity will ensure that all protocols are followed, and records maintained. • Recommended Guidance: USAID Sector Environmental Guideline for Solid Waste.
Sub-activity 20.3: Extraction and analysis of volatile and non-volatile organic compounds	Same as Sub-activity 20.2
Sub-activity 20.4: Evaluation of plant extracts toxicity	Same as Sub-activity 20.2
Sub-activity 20.5: Assessment of the biological activity (anti-oxidant, anti-cytotoxicity, and anti-genotoxicity activity) of plant extracts and their fractions.	None

PROJECT 21: SOLAR DRYER INTEGRATED WITH ENERGY STORAGE SYSTEM: AN ENERGY EFFICIENT AND ENVIRONMENTALLY FRIENDLY TECHNOLOGY FOR DRYING BIOMATERIALS IN TANZANIA

TABLE 5N. SUMMARY OF MITIGATION MEASURES FOR PROJECT 21

Sub-Activity	Mitigation Measure(s)
Sub-activity 21.1: Preparation and characterization of thermal energy-storage materials (rocks)	<ul style="list-style-type: none"> • Rocks will not be sourced from environmentally sensitive or protected areas (e.g. riverbeds and national parks). • Appropriate measures will be taken to ensure worker and public safety when rocks are processed.
Sub-activity 21.2: Construction of a solar cabinet dryer prototype	<ul style="list-style-type: none"> • All waste including hazardous and non-hazardous waste must be properly managed and disposed of. • If there are hazardous materials on site (e.g., paints), they must be properly identified, labeled, managed, and disposed of.

	<ul style="list-style-type: none"> • If PV systems are installed on the solar dryer, verify to the extent possible that the source/origin of the system demonstrate due diligence in mining and processing of materials used in manufacturing. • PV batteries, if used, will be disposed of appropriately as hazardous waste. • To the extent possible, elements of green construction should be integrated through sourcing green materials and waste reduction measures. • Ensure that all necessary measures will be taken to prevent accidents during construction/installation by defining clear procedures and using personal protective equipment (e.g., eye protection, dust masks, helmets, gloves, hearing protection equipment, safety boots, etc.). • Recommended Guidance: USAID Sector Environmental Guideline for Solid Waste.
Sub-activity 21.3: In-situ experimental and theoretical performance analysis of the developed dryer	<ul style="list-style-type: none"> • Electric/electronic components must be secured out of reach of children, the general public, and unauthorized personnel.
Sub-activity 21.4: Quality assessment and chemical analysis of the dried products	<ul style="list-style-type: none"> • Where applicable, laboratories will have Standard Operating Procedures (SOPs) that incorporate sound environmental management including minimization of air emissions, management of water discharges, management of solid waste, and safe handling of hazardous waste. • After delivery of chemicals by the suppliers, the chemicals are inspected by the well-trained lab technicians/scientists, and fully labeled (user's name, date received, date opened and the expiration date). Chemicals are stored in the safe cabinets located at the lab where only authorized personnel have access to it. The team will abide by a data sheet of each individual chemical. Flammable chemicals are stored in approved separate storage cabinets by properly following environmental health and safety guidelines. Users request chemicals during the time of use and are directed to return the remaining amount. • The laboratory has trained/qualified laboratory technicians and scientists who ensure that students and other researchers working in the lab are inducted in safety, good laboratory practices, and issues related to safe disposal of chemicals. In addition, the laboratory has a "quality and safety section" whose responsibility includes to ensure users of the lab adhere to the safety and waste disposal manuals. It ensures, for example, that Fume chambers and Personal Protective Equipment (PPEs) are used whenever necessary. We strive to operate as an International Organization for Standardization (ISO) prescribes. Lab scientists and technicians are always available in the labs where experiments are being conducted to ensure the requested chemicals are correctly used and for the intended purpose. Users are requested to return chemicals after each use.

	<ul style="list-style-type: none"> NM-AIST has a laboratory policy that prescribes how labs operate. The policy has 'safety and waste disposal manuals' detailing, among other things, waste disposal procedures. Chemicals are classified as non-volatiles, inorganics and solvents/volatiles. When disposal of expired (very infrequent) or unused chemicals (normally in small quantities) is required, the non-volatile organics are incinerated at the institution (NM-AIST) using a high-temperature incinerator available at the university while taking care of all environmental health and safety measures. Inorganics and solvents/volatile chemicals are collected by the National Environment Management Council (NEMC) for proper disposal. NEMC is a national environmental management authority that ensures a clean, safe and healthy environment for the people of Tanzania. Proper disposal can be expensive, the university therefore encourages centralized purchase of chemicals to ensure that duplicate orders are not made by different members of the lab and avoid over-ordering. Lab personnel conduct regular disposal of waste or unwanted /unused chemicals (normally in small quantities) to reduce the quantities stored and release valuable storage space.
Sub-activity 21.5: Economic evaluation of the developed system	None

PROJECT 22: IMPROVING SUSTAINABILITY AND RESILIENCE OF PERUVIAN AMAZON SYSTEMS THROUGH SILVOPASTORALISM

TABLE 5P. SUMMARY OF MITIGATION MEASURES FOR PROJECT 22

Sub-Activity	Mitigation Measure(s)
Sub-activity 22.1: Perform a holistic assessment of sustainability and resilience of silvopastoral systems compared with conventional pasture-based systems	<ul style="list-style-type: none"> The project should ensure that the proposed activity in such areas is explained to and permitted by landholders and farmers Consult local communities and other key stakeholders on the proposed project Manage and dispose of waste properly Take only the smallest samples necessary Take special care when undertaking works in areas where plants and animals are protected. Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on habitat.
Sub-activity 22.2: Strengthen students' capacities in sustainability assessment and livestock	None

production systems in tropical regions	
Sub-activity 22.3: Recommend strategies for sustainable and resilient livestock production in the Amazon to stakeholders including producers, policy makers, and industry leaders	None
Sub-activity 22.4: Estimate carbon storage potential of silvopastoral systems compared with conventional pasture-based systems	<ul style="list-style-type: none"> • If groundwater is assessed to be sensitive in the site study, then steps must be taken to protect it during the works if there is potential for disturbance of the ground to affect groundwater quality. Steps to avoid contaminating groundwater include the use of appropriate bore techniques to isolate aquifers when drilling and restricting the depth of excavations if contaminants are present at or near the water table, or are likely to be mobilized as a result of the intrusive investigations. • Take care to avoid spreading contamination into previously uncontaminated areas of the site. Controls on the movement of equipment and vehicles from contaminated to uncontaminated areas should be in place. During sampling work, contaminated spoil material should be handled appropriately.

PROJECT 23: AGRIVOLTAIC TECHNOLOGY IN DRYLANDS OF WEST AFRICA: STRENGTHENING NATIONAL INNOVATION SYSTEMS FOR DIFFUSION AND MARKET DEVELOPMENT AT THE WATER-ENERGY-FOOD NEXUS

TABLE 5Q. SUMMARY OF MITIGATION MEASURES FOR PROJECT 23

Sub-Activity	Mitigation Measure(s)
Sub-activity 23.1: Design and construct pilot agrivoltaic systems with a solar-powered drip irrigation system for concurrent renewable energy and food production in two climatic zones of Ghana: tropical rainforests and tropical savanna.	<ul style="list-style-type: none"> • If possible, verify that source/origin of PV systems demonstrate due diligence in mining and processing of materials used in manufacturing • Ensure PV batteries are disposed of appropriately as hazardous waste • Ensure PV and drip irrigation system have limited access and consider theft prevention strategies • Plots confirmed to be in areas without sensitive ecological habitats • Assess quality of groundwater • Calculate yield and extraction rates in relation to other area water uses and available supply • Follow best practices for design and construction • Recommended Guidance: USAID Sector Environmental Guideline for Small-Scale Energy, Water Supply and Sanitation, and Crop Production
Sub-activity 23.2: Evaluate the potential impacts of the pilot systems for improved renewable energy generation, irrigation water management and food production.	<ul style="list-style-type: none"> • Pesticide procurement, use, or support is <u>not permitted</u> without an approved Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) in place. • Monitor and repair leaks from irrigation system and ensure no standing water is left at site • Maintenance of the borehole equipment

	<ul style="list-style-type: none"> • Monitor water levels to detect overdrawing • Manage and dispose of waste properly • Take only the smallest samples necessary • Use best practices for crop production in accordance with recommended guidance below • Recommended guidance: USAID Sector Environmental Guideline for Small-Scale Energy, Water Supply and Sanitation, and Crop Production
Sub-activity 23.3: Evaluate the potential socioeconomic and environmental impacts of the pilot system in selected districts of Ghana.	None
Sub-activity 23.4: Disseminate the results and establish an appropriate transition arena of key stakeholders.	<ul style="list-style-type: none"> • Recommendations for scaling agrivoltaic systems must include considerations for the environmental and social impacts, as well as cumulative impacts, of such systems, which may be disproportionate to those evaluated in Sub-activity 23.3 above.

PROJECT 24: CLIMATE MITIGATION POTENTIAL OF COLOMBIA’S LOWLAND PEATLANDS: DISTRIBUTION, EMISSION FACTORS AND CONSERVATION PRIORITIES

TABLE 5R. SUMMARY OF MITIGATION MEASURES FOR PROJECT 24

Sub-Activity	Mitigation Measure(s)
Sub-activity 24.1 Develop a high-resolution map of peatland distribution, peat depth, and carbon stocks of peatlands in the Colombian Amazon	None
Sub-activity 24.2 Ground-truthing to validate peatland map through peat sampling, observation, and analysis	<ul style="list-style-type: none"> • The project should demonstrate that the proposed activity in such areas is legally permitted • Act in a manner consistent with defined protected area management plans • Consult protected area sponsors and managers, local communities, and other key stakeholders on the proposed project • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take only the smallest samples necessary • Take special care when undertaking works in areas where plants and animals are protected. • Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on habitat.
Sub-activity 24.3 Quantify the main factors associated with changes in soil GHG emissions and peat accumulation rate from Amazonian peatlands under different disturbance regimes (forest degradation and deforestation).	
Sub-activity 24.4 Develop mapping and monitoring protocols that are	None

compatible with the forest monitoring and the national inventory programs.	
Sub-activity 24.5 Cross-training and building local analytical capabilities	None

PROJECT 26: THE EFFECTS OF EXCESSIVE WATER USE AND AGRICULTURAL INTENSIFICATION ON ARAL SEA SHRINKAGE: SES DYNAMICS WITHIN THE SYR DARYA RIVER BASIN

TABLE 5S. SUMMARY OF MITIGATION MEASURES FOR PROJECT 26

Sub-Activity	Mitigation Measure(s)
Sub-activity 26.1: Construction of a comprehensive database of social, economic, climate, soil, vegetation, and hydrology features, including installation of microclimatic stations and sampling along transects.	<ul style="list-style-type: none"> • The project should demonstrate that the proposed activity in such areas is legally permitted. • Minimize new trails and follow footsteps • Manage and dispose of waste properly • Take only the smallest samples necessary • Take special care when undertaking works in areas where plants and animals are protected. • Identify the effects of the site activity and undertake appropriate measures to minimize any adverse effects. Measures could include timing the schedule of the works at certain times (e.g., not during breeding season), using investigation techniques with minimal disturbance, and relocating sampling locations to areas with less impact on habitat. • If groundwater is assessed to be sensitive in the site study, then steps must be taken to protect it during the works if there is potential for disturbance of the ground to affect groundwater quality. Steps to avoid contaminating groundwater include the use of appropriate bore techniques to isolate aquifers when drilling and restricting the depth of excavations if contaminants are present at or near the water table or are likely to be mobilized as a result of the intrusive investigations. • Take care to avoid spreading contamination into previously uncontaminated areas of the site. Controls on the movement of equipment and vehicles from contaminated to uncontaminated areas should be in place. During sampling work, contaminated spoil material should be handled appropriately.
Sub-activity 26.2: Explore the interdependent changes of food, energy, and water for the three districts with high-resolution data for mechanistic understanding of coupled changes between climate and land use.	None
Sub-activity 26.3: Identify critical drivers (including policy shifts) on stream flows and ET loss through data analysis and the installation of	None

three WMO standard microclimatic stations.	
Sub-activity 26.4: Develop an open-access webpage to share all data and research findings publicly.	None
Sub-activity 26.5: Build capacity and knowledge to understand physical and socioeconomic changes.	None

PROJECT 27: RENEWABLE HYDROGEN GENERATION WITH CARBON RECYCLING (ReHyCaRe) FROM BIOGENIC RESIDUES OF BANGLADESH

TABLE 5T. SUMMARY OF MITIGATION MEASURES FOR PROJECT 27

Sub-Activity	Mitigation Measure(s)
Sub-activity 27.1 Lifecycle assessment of environmental impacts of biogas cleaning, CaDRe, and bio-slurry management	None
Sub-activity 27.2 Scoping study, feedstock characterization, and pre-treatment of feedstock.	<ul style="list-style-type: none"> Follow established guidelines for management of waste generated during treatment and experimentation, including following the guidelines of the Department of Environment (DoE), Government of Bangladesh. Recommended guidance: USAID Sector Environmental Guidelines for Small-Scale Energy
Sub-activity 27.3 Bench-scale experimental activity with anaerobic co-digestion of biogenic residues, biogas cleaning, and catalytic reforming of biogas for H ₂ production	<ul style="list-style-type: none"> Follow established guidelines for management of waste generated during treatment and experimentation, including following the guidelines of the Department of Environment (DoE), Government of Bangladesh. The project must apply spill and pollution prevention procedures for handling and storage of materials and containers. All containers will be clearly and adequately labelled to identify the contents. Recycle used chemicals when safe and appropriate Use high quality reactors to avoid methane gas leakages from gas collection chambers and piping. Experiments are expected to generate negligible amounts of biogas, carbon dioxide and methane. Recommended guidance: USAID Sector Environmental Guidelines for Small-Scale Energy
Sub-activity 27.4 Techno-economic analysis of the integrated concept through building a process model	None
Sub-activity 27.5 Dissemination, management, reporting, capacity building, and progress meetings	None

PROJECT 28: WATER HARVESTING AT COMMUNITY LEVEL FOR ENHANCED ACCESS TO GROUND WATER

TABLE 5U. SUMMARY OF MITIGATION MEASURES FOR PROJECT 28

Sub-Activity	Mitigation Measure(s)
Sub-activity 28.1: Collection of primary data related to water quantity, quality, and harvesting	<ul style="list-style-type: none"> Assess quality of groundwater during investigation Recommended Guidance: USAID Sector Environmental Guideline for Water Supply and Sanitation
Sub-activity 28.2: Development of integrated modeling system to assess the effects of rainwater harvesting	None
Sub-activity 28.3: Drilling of piezometric wells and establishment of percolation ponds to determine aquifer properties, soil characteristics, and to monitor the recharge efficiency of rainwater harvesting on groundwater level	<ul style="list-style-type: none"> Utilize best practices for well siting and construction in alignment with below guidance, ensuring safe distance from sanitation systems, quality of water, and protection from livestock Consider how the project will impact the water table level, particularly in the context of climate change Calculate yield and extraction rates in relation to other area water uses and available supply. Monitor water levels to detect overdrawing Ensure proper maintenance of wells and ponds to prevent breeding grounds of disease vectors Percolation ponds must not be constructed in locations with sensitive ecological habitats or presence of threatened/endangered species Recommended Guidance: USAID Sector Environmental Guideline for Water Supply and Sanitation and Construction
Sub-activity 28.4: Impact assessment of artificial recharge structures	None
Sub-activity 28.5: Raising awareness, training, and dissemination of information	<ul style="list-style-type: none"> Any recommendations resulting from this study should emphasize the need to consider cumulative impacts of wells on groundwater supply, as well as likely impacts from climate change. Recommendations to farmers on crop variations must include information on climate smart and sustainable agriculture, including management of water resources and agricultural inputs

6.0 LIMITATIONS OF THIS INITIAL ENVIRONMENTAL EXAMINATION

The determinations recommended in this document apply only to projects/activities and sub-activities described herein. Other projects/activities that may arise must be documented in either a separate PIEE, an IEE amendment if the activities are within the same project/activity, or other type of environmental compliance document and shall be subject to an environmental analysis within the appropriate documents listed above.

It is confirmed that the projects/activities described herein do not involve actions normally having a significant effect on the environment, including those described in 22 CFR 216.2(d).

In addition, other than projects/activities determined to have a Positive Threshold Determination and/or a pesticide management plan (PERSUAP), it is confirmed that the projects/activities described herein do not involve any actions listed below. Any of the following actions would require additional environmental analyses and environmental determinations:

- Support project preparation, project feasibility studies, or engineering design for activities listed in §216.2(d)(1);
- Affect endangered and threatened species or their critical habitats per §216.5, FAA 118, FAA 119;
- Provide support to extractive industries (e.g., mining and quarrying) per FAA 117;
- Promote timber harvesting per FAA 117 and 118;
- Lead to new construction, reconstruction, rehabilitation, or renovation work per §216.2(b)(1);
- Support agro-processing or industrial enterprises per §216.1(b)(4);
- Provide support for regulatory permitting per §216.1(b)(2);
- Lead to privatization of industrial facilities or infrastructure with heavily polluted property per §216.1(b)(4);
- Research, testing, or use of genetically engineered organisms per §216.1(b)(1), ADS 211
- Assist the procurement (including payment in kind, donations, guarantees of credit) or use (including handling, transport, fuel for transport, storage, mixing, loading, application, clean-up of spray equipment, and disposal) of pesticides or activities involving procurement, transport, use, storage, or disposal of toxic materials. Pesticides cover all insecticides, fungicides, rodenticides, etc. covered under the Federal Insecticide, Fungicide, and Rodenticide Act per §216.2(e) and §216.3(b).

7.0 REVISIONS

Per 22 CFR 216.3(a)(9), when ongoing programs are revised to incorporate a change in scope or nature, a determination will be made as to whether such change may have an environmental impact not previously assessed. If so, this PIEE will be amended to cover the changes. Per ADS 204, it is the responsibility of the USAID A/COR to keep the MEO/REA and BEO informed of any new information or changes in the activity that might require revision of this environmental analysis and environmental determination.

ATTACHMENTS:

Attachment 1: [EMMP Template](#)

Attachment 2: [EMMR Template](#)

Attachment 3: Climate Risk Management Summary Table for Projects

ATTACHMENT 3. PROJECT CLIMATE RISK MANAGEMENT SUMMARY TABLES

PROJECT 1: DEVELOPING A FRAMEWORK FOR THE IDENTIFICATION OF SOIL LIMITING FACTORS FOR BIOREMEDIATION OF DIOXIN COMPOUNDS IN CONTAMINATED SOILS OF VIETNAM

TABLE A. CRM SUMMARY TABLE FOR PROJECT 1

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level ⁸	Further Analysis and Actions for Activity Design/ Implementation ⁹	Opportunities to Strengthen Climate Resilience ¹⁰
Developing a framework for the identification of soil limiting factors for bioremediation of dioxin compounds in contaminated soils of Vietnam	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could inhibit access routes to or locations where samples will be collected.	Low	N/A	N/A	N/A
	Extreme climate events (e.g., storms, floods, droughts, and landslides) could inhibit the extent to which field-based bioremediation efforts and technologies are effective.	Moderate	N/A	Consider the conditions of sites, including changing weather patterns, in the design of any bioremediation activities. Conduct bioremediation in the field during the dry season when storms are less frequent.	Improved understanding of effective bioremediation techniques to reduce dioxin levels in soil could increase human health while improving agricultural yields.
	In-person trainings, meetings, events, and capacity building activities may result in	Low	N/A	N/A	N/A

⁸ Describe how risks have been addressed at the project level. If a decision has been made to accept the risk, briefly explain why.

⁹ Describe CRM measures to be integrated into activity design or implementation, including additional analysis, if applicable.

¹⁰ Describe opportunities to achieve development objectives by integrating climate resilience or mitigation measures.

	increased exposure or vulnerability to climate-related risks.				
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PROJECT 2: BIOCHAR FACILITATED BIOREMEDIATION: A GREEN SOLUTION FOR DIOXIN/FURAN POLLUTION
TABLE B. CRM SUMMARY TABLE FOR PROJECT 2

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Biochar Facilitated Bioremediation: A Green Solution for Dioxin/Furan Pollution	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could inhibit access routes to or locations where samples will be collected.	Low	N/A	N/A	N/A
	Extreme climate events (e.g., storms, floods, droughts, and landslides) could inhibit the extent to which field-based bioremediation efforts and technologies are effective.	Moderate	N/A	Consider the conditions of sites, including changing weather patterns, in the design of any bioremediation activities. Conduct bioremediation in the field during the dry season when storms are less frequent.	Improved understanding of effective bioremediation techniques to reduce dioxin levels in soil could increase human health while improving agricultural yields. Propose remediation alternatives for evaluation which consider the impacts of climate change.
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or	Low	N/A	N/A	N/A

	vulnerability to climate-related risks.				
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PROJECT 3: NANO-ASSISTED BIOREMEDIATION OF DIFFUSED DIOXINS IN SOIL AND SEDIMENT

TABLE C. CRM SUMMARY TABLE FOR PROJECT 3

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Nano-assisted bioremediation of diffused dioxins in soil and sediment	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could inhibit access routes to or locations where samples will be collected.	Low	N/A	N/A	N/A
	Extreme climate events (e.g., storms, floods, droughts, and landslides) could inhibit the extent to which field-based bioremediation efforts and technologies are effective.	Moderate	N/A	Consider the conditions of sites, including changing weather patterns, in the design of any bioremediation activities. Conduct bioremediation in the field during the dry season when storms are less frequent.	Improved understanding of effective bioremediation techniques to reduce dioxin levels in soil could increase human health while improving agricultural yields. Propose remediation alternatives for evaluation which consider the impacts of climate change.
	After application, nZVI mobility is influenced by many interrelated environmental parameters, including ionic strength and composition, pH, O ₂ concentration, presence of natural organic matter, and hydraulic conductivity of the environmental medium, as well as intrinsic properties of the nZVI	Moderate	N/A	Consider the conditions of sites, including changing weather patterns, in the design of any bioremediation activities. Conduct bioremediation in the	Improved understanding of effective bioremediation techniques to reduce dioxin levels in soil could increase human health while improving agricultural yields. Propose remediation alternatives for evaluation

	particles such as surface coating, size, and concentration. ¹¹ Extreme climate events (e.g., storms, floods) could influence the mobility, fate, and toxicity of nZVI particles.			field during the dry season when storms are less frequent.	which consider the impacts of climate change.
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A

PROJECT 4: COMMUNITY AND HOSPITAL-BASED OBSTETRICS WHATSAPP TRIAGE, REFERRAL, AND TRANSFER (WAT-RT) SYSTEM
TABLE D. CRM SUMMARY TABLE FOR PROJECT 4

Defined or Anticipated Project Elements	Climate Risks ¹²	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Community and Hospital-based Obstetrics WhatsApp Triage, Referral, and Transfer (WAT-RT) System.	Human health risks from extreme weather events, increasing temperatures, and shifting disease patterns can lead to increased healthcare needs, adding pressure to the WAT-RT and waste management systems.	Moderate	N/A	Ensure training includes consideration, planning and contingencies for increased pressure on the healthcare system from climate-related impacts to human health.	Work with local authorities to integrate health considerations into climate early warning systems to prepare health facilities in advance for increased pressure.
	Extreme weather events, such as flooding, can impede transportation and access to health facilities for staff and trainers and challenge the	Moderate	N/A	Include consideration of the impacts of climate-related extreme events to the various steps of the WAT-RT system	Work with local authorities on early warning systems to have as much advanced notice as possible to anticipate

¹¹ Lefevre E, Bossa N, Wiesner MR, Gunsch CK. A review of the environmental implications of in situ remediation by nanoscale zero valent iron (nZVI): Behavior, transport and impacts on microbial communities. *Sci Total Environ.* 2016; 565:889-901. doi:10.1016/j.scitotenv.2016.02.003

¹² [Reference: USAID Liberia Climate Change Risk Profile; USAID Ghana Climate Change Risk Profile](#)

	ability of patients to travel from rural clinics to referral hospitals.			and ensure flexibility and alternatives are available.	and adapt to challenges in transportation and accessibility of health facilities for both patient care and training.
	Increased power outages from weather events and/or increased energy demand resulting in diminished energy supply for waste operations.	Low	N/A	N/A	N/A

PROJECT 5: BRIDGING HIGHER EDUCATION AND PRACTICE: ADDRESSING GENDER INEQUITY IN STEM AND SANITATION IN MALAWI
TABLE E. CRM SUMMARY TABLE FOR PROJECT 5

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Bridging Higher Education and Practice: Addressing Gender Inequity in STEM and Sanitation in Malawi	Extreme weather events such as droughts, heavy rainfall and flooding - resulting from climate change - could impact the project by preventing the project team from conducting the research and analysis and meeting with participants of the study.	Low	N/A	N/A	N/A
	Infrastructure to be used for IT, research, analysis etc. may be damaged by extreme weather events.	Low	N/A	N/A	N/A
	Increased power outages from weather events and/or increased energy demand resulting in diminished energy supply for waste operations.	Low	N/A	N/A	N/A

PROJECT 6: LIVELIHOOD CHANGE IN THE CONTEXT OF COMMUNITY CONSERVATION

TABLE F. CRM SUMMARY TABLE FOR PROJECT 6

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Livelihood Change in the Context of Community Conservation	Extreme weather events such as droughts, heavy rainfall and flooding - resulting from climate change - could impact the locations where project studies take place.	Low	N/A	N/A	N/A
	Infrastructure to be used for IT, research, analysis etc. may be damaged by extreme weather events.	Low	N/A	N/A	N/A

PROJECT 7: THE EVALUATION OF CHALLENGES OF YOUTH IN KAZAKHSTAN AND PILOTING INNOVATIVE SOLUTIONS
TABLE G. CRM SUMMARY TABLE FOR PROJECT 7

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
The evaluation of challenges of youth in Kazakhstan and piloting innovative solutions	Extreme weather events such as storms, increased temperatures, droughts, heavy rainfall and flooding - resulting from climate change - could impact the project by preventing the project team from conducting the research and analysis and meeting with participants of the study.	Low	N/A	N/A	N/A
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A

PROJECT 8: MOROGORO YOUTH EMPOWERMENT THROUGH ESTABLISHMENT OF SOCIAL INNOVATION (YEESI) LAB FOR PROBLEM-CENTERED TRAINING IN MACHINE VISION

TABLE H. CRM SUMMARY TABLE FOR PROJECT 8

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Morogoro Youth Empowerment through Establishment of Social Innovation (YEESI) Lab for Problem-centered Training in Machine Vision	Physical technologies, tools, and equipment (e.g., cameras) may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Moderate	Avoid low lying and open areas Avoid high-temperature days	N/A	Consider use of weather prediction tools, and waterproof/ temperature-resistant cameras
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A
	Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	N/A

PROJECT 9: LONG-TERM IMPACTS OF LAND-USE/LAND-COVER DYNAMICS ON SURFACE WATER QUALITY IN BOTSWANA'S RESERVOIRS USING SATELLITE DATA AND ARTIFICIAL INTELLIGENCE METHODS: CASE STUDY OF THE BOTSWANA'S LIMPOPO RIVER BASIN

TABLE I. CRM SUMMARY TABLE FOR PROJECT 9

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Long-term impacts of land-use/land-cover dynamics on surface water quality in Botswana's reservoirs using	Physical technologies, tools, and equipment (e.g., UAV-borne spectrometer) may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	N/A

satellite data and artificial intelligence methods: case study of the Botswana's Limpopo River Basin	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could impede transportation and access to field visits.	Low	N/A	N/A	N/A
	Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	N/A

PROJECT 10: ENGAGING THE PRIVATE SECTOR IN INCREASING VOLUNTARY USE OF LONG-ACTING REVERSIBLE CONTRACEPTIVES AND PERMANENT FAMILY PLANNING METHODS IN RURAL AREAS OF BANGLADESH
TABLE J. CRM SUMMARY TABLE FOR PROJECT 10

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Engaging the private sector in increasing voluntary use of long-acting reversible contraceptives and permanent family planning methods in rural areas of Bangladesh	Human health risks from extreme weather events, increasing temperatures, and shifting disease patterns can lead to increased healthcare needs, adding pressure to health facilities and waste management systems.	Moderate	N/A	Ensure training includes consideration, planning and contingencies for increased pressure on the healthcare system from climate-related impacts to human health.	Work with local authorities to integrate health considerations into climate early warning systems to prepare health facilities in advance for increased pressure.
	Extreme weather events, such as flooding, can impede transportation and access to health facilities for staff, patients and trainers.	Moderate	N/A	Include consideration of the impacts of climate-related extreme events in training and ensure flexibility and alternatives are available.	Work with local authorities on early warning systems to have as much advanced notice as possible to anticipate and adapt to challenges in transportation and accessibility of health facilities

					for both patient care and training.
	Increased power outages from weather events and/or increased energy demand resulting in diminished energy supply for waste operations.	Low	N/A	N/A	N/A

PROJECT 11: YOUNG WIVES: AN EXPLORATORY STUDY OF MARRIED WOMEN BELOW TWENTY AND THE SOCIO-CULTURAL DETERMINANTS OF THEIR CONTRACEPTIVE BEHAVIOR IN LOW RESOURCE SETTINGS IN INDIA
TABLE K. CRM SUMMARY TABLE FOR PROJECT 11

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Young Wives: An Exploratory Study of Married Women Below Twenty and the Socio-Cultural Determinants of their Contraceptive Behavior in Low Resource Settings in India	Human health risks from extreme weather events, increasing temperatures, and shifting disease patterns can lead to increased healthcare needs, adding pressure to health facilities and waste management systems.	Moderate	N/A	Ensure training includes consideration, planning and contingencies for increased pressure on the healthcare system from climate-related impacts to human health.	Work with local authorities to integrate health considerations into climate early warning systems to prepare health facilities in advance for increased pressure.
	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could impede transportation and access to field visits.	Moderate	N/A	Include consideration of the impacts of climate-related extreme events in training and ensure flexibility and alternatives are available. Weather advisory/reports will always be monitored.	Work with local authorities on early warning systems to have as much advanced notice as possible to anticipate and adapt to challenges in transportation and accessibility of health facilities for both patient care and training.

	Wasteful use of paper	Low	Use of mobile technology for data collection	N/A	N/A
	Carbon emission due to frequent travel by research team	Low	Use of audio recordings to observe the quality of fieldwork in some cases, as a replacement for supervisor visits. Use of videoconferencing to avoid travel to maximum extent possible	N/A	N/A

PROJECT 12: ASSESSMENT AND COMPARISON OF RECOVERY OF BIODIVERSITY AND CARBON SEQUESTRATION IN PHILIPPINE MANGROVES AMONG NATURAL, REPLANTED AND NATURALLY-RECOLONIZED MANGROVE STANDS
TABLE M. CRM SUMMARY TABLE FOR PROJECT 12

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Assessment and Comparison of Recovery of Biodiversity and Carbon Sequestration in Philippine Mangroves Among Natural, Replanted and Naturally-recolonized Mangrove Stands	Physical technologies, tools, and equipment may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	<p>Further incorporate resilience measures into recovery to mitigate negative impacts of future disasters. For example, planting appropriate vegetation on coastlines that would protect from storm surges or integrating disaster awareness into education projects.</p> <p>Enhance early warning systems.</p> <p>Strengthen available risk information through community mapping and open-source platforms.</p>

					<p>Enhance support for information-sharing systems and services, which may involve strengthening networks and promoting dialogue and cooperation among scientific communities and practitioners.</p> <p>Contribute to generating knowledge on the role of healthy vs restored vs damaged mangroves in CCAM</p>
Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	N/A	N/A
The potential for increased frequency and/or intensity of extreme climate-related events such as flooding to exacerbate soil erosion and its environmental degradation effect at soil sampling sites.	Moderate	An appropriate sampling procedure will be followed	Proper sampling design will be developed	N/A	N/A
In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A	N/A
Closure and/or diminished access to low-lying coastal transportation routes (roads, rail) due to permanent inundation or temporary flooding caused by sea level rise	Moderate	The project will contribute to generating knowledge on the role of healthy vs restored vs damaged	The project will generate important information on climate change adaptation and mitigation (CCAM) program, such as	N/A	N/A

	and increased intensity of storm surge.		<p>mangroves in CCAM.</p> <p>The project will comply with government advisory on trips and sampling.</p> <p>Weather advisory/reports will always be monitored.</p>	in resiliency against typhoon and sea	
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PROJECT 13: ASSESSMENT OF THE RESILIENCE OF LOCAL BALADI GOAT IN LEBANON: A VIABLE SUSTAINABLE SOLUTION TO A CHANGING CLIMATE IN A TRANSHUMANT SYSTEM
TABLE N. CRM SUMMARY TABLE FOR PROJECT 13

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Assessment of the resilience of Local Baladi goat in Lebanon: a viable sustainable solution to a changing climate in a transhumant system	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides can damage equipment and inhibit facility access.	Low	N/A	N/A	N/A
	Increasing temperatures, changes in water and pasture availability, and emerging infectious diseases can negatively impact goats to be sampled.	Low	Evaluation of Baladi goat's resilience is built into project design.	N/A	N/A

PROJECT 14: BIODIVERSITY CORRELATES OF SUSTAINABLE VALUE CHAIN EXPANSION IN THE BRAZILIAN AMAZON: DEVELOPING COMBINED ENVIRONMENTAL DNA (EDNA) AND CAMERA TRAPPING PROTOCOLS TO ASSESS VERTEBRATE DIVERSITY IN MANAGED BRAZIL NUT FORESTS

TABLE O. CRM SUMMARY TABLE FOR PROJECT 14

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Biodiversity correlates of sustainable value chain expansion in the Brazilian Amazon: Developing combined environmental DNA (eDNA) and camera trapping protocols to assess vertebrate diversity in managed Brazil nut forests	Physical technologies, tools, and equipment (e.g., camera traps) may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	Continued long-term monitoring of biodiversity in Brazil nut forest would enable understanding of interactions between the impacts of climate change on Brazil nut production and of continued Brazil nut harvesting on Brazil-nut dependent wildlife
	Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	

PROJECT 15: INCLUSIVE ECONOMIC GROWTH FOR SUSTAINABLE PEACE? ASSESSING DEVELOPMENT MECHANISMS AND CONSERVATION EFFORTS IN POST-CONFLICT COLOMBIA

TABLE P. CRM SUMMARY TABLE FOR PROJECT 15

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Inclusive Economic Growth for	Extreme weather events such as storms, increased	Low	N/A	N/A	N/A

Sustainable Peace? Assessing Development Mechanisms and Conservation Efforts in Post-Conflict Colombia	temperatures, droughts, heavy rainfall and flooding - resulting from climate change - could impact the project by preventing the project team from conducting the research and analysis and meeting with participants of the study.				
	In-person interviews, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A

PROJECT 16: ASSESSMENT OF GEOTHERMAL ENERGY RESOURCES AND NATURAL HAZARDS IN ARMENIA
TABLE Q. CRM SUMMARY TABLE FOR PROJECT 16

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Assessment of Geothermal Energy Resources and Natural Hazards in Armenia	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could inhibit access routes to or locations where data will be collected.	Low	N/A	N/A	N/A
	Extreme climate events (e.g., storms, floods, droughts, and landslides) could inhibit the extent to which field-based geothermal energy exploration and data collection are performed.	Low	N/A	N/A	N/A

	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A
	Physical technologies, tools, and equipment (e.g., field volcanology, seismic tomography, ambient noise tomography (ANT), gravity field survey) may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	N/A

PROJECT 17: IMPROVING HUMAN LIVELIHOODS THROUGH HOLISTIC CONSERVATION OF MALAGASY ORPHANED PLANTS, THE ICONIC BAOBAB TREES

TABLE R. CRM SUMMARY TABLE FOR PROJECT 17

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Improving human livelihoods through holistic conservation of Malagasy orphaned plants, the iconic Baobab trees	Stakeholder meetings might not be able to be held in person due to climate disasters	Low	N/A	N/A	N/A
	Inaccessibility of site due to increasing flood during rainy season	Low	N/A	N/A	N/A
	Higher demand for water during droughts increases conflicts among water users	Low	N/A	N/A	N/A
	Decreased water quality due to erosion and sedimentation	Moderate	N/A	Identify and prioritize technologies for	Strengthen disaster planning and

from deforestation and riverbank erosion			water-related adaptation.	response for water infrastructure and water services.
Reducing fruit production due to severe drought	Moderate		Improve monitoring and evaluation systems to measure changes in water-related vulnerability and resilience to climate change and to promote adaptive management.	Improve public education and outreach efforts related to watershed protection, water demand, water sanitation, and other factors relevant to water-related climate impacts and adaptation.
Contamination of clean water due to flooding	Moderate		Examine the extent to which effective environmental and climate monitoring systems are in place to support adaptation measures	Drought early warning system
Increased water contamination due to low flows in streams	Moderate		Improve water storage, conservation, and water demand management to account for climate-driven changes in supply and demand	Implement rainwater harvesting and greywater reuse for agriculture, where appropriate.
Reduced ability of rivers to dilute and carry away contaminants due to low-flow periods	Moderate			
Decrease water supply caused by warmer temperatures and prolonged drought.	Moderate			
Mortality of seedlings due to severe drought	High	Target the period to establish the nursery trees during the rainy season and also the transplanting seedlings	Improve seed storage and anticipate the increase of seed germination to ensure the high rate of seedling survival	Drought early warning system Implement rainwater harvesting and greywater reuse for agriculture, where appropriate.
Mortality of baobab adults due to anthropogenic or non-anthropogenic fire	High	Preventing anthropogenic fires in baobab forests	Analyzing the effects of fire passages on baobab adult survival	Conflict prevention between land use for agriculture using the

					slash and burn practice and protection of baobabs that will ensure new income for households
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PROJECT 18: MULTI-SCALE, INTERDISCIPLINARY INTEGRATED ANALYSIS OF SOCIETAL AND ECOSYSTEM VALUES OF PERUVIAN AMAZON PEATLANDS

TABLE S. CRM SUMMARY TABLE FOR PROJECT 18

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Multi-Scale, Interdisciplinary Integrated Analysis of Societal and Ecosystem Values of Peruvian Amazon Peatlands	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could inhibit access routes to or locations where plots and transects will be established and samples collected.	Low	Moving field-monitoring activities to dry season	Flood effects on socio-economic activities related to peatlands will be measured if relevant	After analysis, climate resiliency solutions will be proposed
	Physical technologies, tools, and equipment may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	N/A
	Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	N/A
	In-person trainings, meetings, events, stakeholder engagement, and capacity	Low	N/A	N/A	N/A

	building activities may result in increased exposure or vulnerability to climate-related risks.				
	The potential for increased frequency and/or intensity of extreme climate-related events such as flooding to exacerbate soil erosion and its environmental degradation effect at soil sampling sites	Moderate	An appropriate sampling procedure will be followed	Proper sampling design will be developed	N/A

PROJECT 19: CREATING KNOWLEDGE ON COCOA POLLINATORS IN AGROFORESTRY SYSTEMS OF THE DOMINICAN REPUBLIC FOR IMPROVING PLANTATION MANAGEMENT PRACTICES
TABLE T. CRM SUMMARY TABLE FOR PROJECT 19

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Creating knowledge on cocoa pollinators in agroforestry systems of the Dominican Republic for improving plantation management practices	Physical technologies, tools, and equipment (e.g., camera traps) may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	Increasing or conserving native habitat on cocoa farms should benefit yield and protect against climate change (e.g., floods, erosion).
	Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	Increase awareness of harmful agricultural practices such as slash and burn agriculture that increases erosion and reduces soil fertility.
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	Support optimization of farm management

					practices conditioned by climate.
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PROJECT 20: PHYTOCHEMICAL, BIOLOGICAL AND TOXICOLOGICAL EVALUATION OF HOP (HUMULUS LUPULUS L.) FROM POPULATIONS GROWING WILD IN KOSOVO

TABLE U. CRM SUMMARY TABLE FOR PROJECT 20

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Phytochemical, biological and toxicological evaluation of hop (<i>Humulus lupulus</i> L.) from populations growing wild in Kosovo	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could inhibit access routes to or locations where samples will be collected.	Low	N/A	N/A	N/A
	Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	N/A
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A

PROJECT 21: SOLAR DRYER INTEGRATED WITH ENERGY STORAGE SYSTEM: AN ENERGY EFFICIENT AND ENVIRONMENTALLY FRIENDLY TECHNOLOGY FOR DRYING BIOMATERIALS IN TANZANIA

TABLE U. CRM SUMMARY TABLE FOR PROJECT 21

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
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Solar dryer integrated with energy storage system: an energy efficient and environmentally friendly technology for drying biomaterials in Tanzania	Increased flooding and heat stress may lead to direct impacts on human health through reduced quality/quantity of water supplies, heat stress, or increased prevalence of water/food- and vector-borne diseases, impacting the health of project staff and construction crews.	Low	N/A	N/A	N/A
	Increasing frequency and/or intensity of heat waves, flash floods, droughts, and landslides, as well as erosion and sea level rise in coastal areas may lead to damaged structures/equipment, disruption of services, and increase in maintenance and repair costs	Low	N/A	N/A	N/A
	Increased frequency and/or intensity of heat waves, droughts, and flooding could reduce the efficiency of solar technologies.	Moderate	The most climate-resilient materials of the available options will be used. Ensure that the technologies are sited in a location where flooding is not likely to occur.	To the extent feasible, consider methods to increase the resilience of the solar dryer to climate change impacts.	Increased resiliency of solar dryer technology in this pilot could encourage climate-proofing of future solar dryer construction.

PROJECT 22: IMPROVING SUSTAINABILITY AND RESILIENCE OF PERUVIAN AMAZON SYSTEMS THROUGH SILVOPASTORALISM
TABLE W. CRM SUMMARY TABLE FOR PROJECT 22

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
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Improving sustainability and resilience of Peruvian Amazon systems through silvopastoralism	Physical technologies, tools, and equipment may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	Strengthen available risk information through community mapping and open-source platforms.
	Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	Enhance support for information-sharing systems and services, which may involve strengthening networks and promoting dialogue and cooperation among scientific communities and practitioners.
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	
	The potential for increased frequency and/or intensity of extreme climate-related events such as flooding to exacerbate soil erosion and its environmental degradation effect at soil sampling sites	Moderate	An appropriate sampling procedure will be followed	Proper sampling design will be developed	
	Increased prevalence of parasites and diseases that affect livestock due to changes in climate conditions.	Moderate	Individual reports will be handed to farmers where they can see the performance of their farm in comparison to the other farms that participated in the project. This will allow them to identify areas in which they could sustainably	Identify performance differences between farmers so that findings can be shared. Develop policy recommendations based on study findings	Promote new public-private partnerships that will strengthen agriculture value chains.
	Reduced animal feeding and decreased growth rates due to higher temperatures.	Moderate			Promote programs to improve the security of property rights and land tenure in order to incentivize
	Reduced fertility, and reduced milk production due to prolonged heat stress.	Moderate			
	Reduced water availability for crops and livestock due to	Moderate			

	increased evaporative demand from higher temperatures.		improve their production. A workshop addressed to policy makers and industry leaders will be held to inform policy makers and industry leaders about research findings and guide future policies. Findings of this project will be published.		agricultural investment. Support financial services for underserved and marginalized populations. Introduce nitrogen-fixing plants. Build awareness of climate change implications for food security.
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PROJECT 23: AGRIVOLTAIC TECHNOLOGY IN DRYLANDS OF WEST AFRICA: STRENGTHENING NATIONAL INNOVATION SYSTEMS FOR DIFFUSION AND MARKET DEVELOPMENT AT THE WATER-ENERGY-FOOD NEXUS
TABLE X. CRM SUMMARY TABLE FOR PROJECT 23

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Agrivoltaic Technology in Drylands of West Africa: Strengthening National Innovation Systems for Diffusion and Market Development at the Water-Energy-Food Nexus	Drought can impact the availability of water supply in boreholes.	Moderate	Evaluation of sustainability is inherent in project design	Groundwater sources must be evaluated to ensure sustainable withdrawal in the context of climate change.	Ensure that recommendations for scale-up of this activity will be in full consideration of climate change impacts to agrivoltaic system, particularly water availability and crop production.
	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as droughts, floods, and landslides could inhibit access routes to or locations where plots and transects will be established and samples collected.	Low	N/A	N/A	

	Greenhouse gas emissions may increase from power generation of the irrigation system.	Low	Renewable energy from solar PV installation will be the main source power for activities such as pumping water from borehole for irrigation	Solar panels are not known to emit GHGs during operation. GHGs are emitted mainly during manufacturing	
	Temperature increase can reduce solar power cell efficiency and energy input	Low	N/A	N/A	
	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as droughts, floods, and landslides can impact agricultural productivity and pest prevalence/distribution.	Moderate	Evaluation of sustainability is inherent in project design	N/A	

PROJECT 24: CLIMATE MITIGATION POTENTIAL OF COLOMBIA'S LOWLAND PEATLANDS: DISTRIBUTION, EMISSION FACTORS AND CONSERVATION PRIORITIES

TABLE Y. CRM SUMMARY TABLE FOR PROJECT 24

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Climate mitigation potential of Colombia's lowland peatlands: distribution, emission factors and conservation priorities	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides could inhibit access routes to or locations where plots and transects will be established and samples collected.	Low	N/A	N/A	N/A

Physical technologies, tools, and equipment may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	N/A
Baseline conditions used for data analysis may lack reliability if underlying climate conditions experience significant changes.	Low	N/A	N/A	N/A
In-person trainings, meetings, events, stakeholder engagement, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A
The potential for increased frequency and/or intensity of extreme climate-related events such as flooding to exacerbate soil erosion and its environmental degradation effect at soil sampling sites.	Moderate	An appropriate sampling procedure will be followed	Proper sampling design will be developed	N/A

PROJECT 25: ENHANCING CAPACITY OF LOCAL COMMUNITIES IN LAIKIPIA COUNTY, KENYA: INCREASING PREPAREDNESS AND RESPONSE TO EMERGING INFECTIOUS DISEASES IN PARALLEL WITH PRESERVATION OF BIODIVERSITY

TABLE Z. CRM SUMMARY TABLE FOR PROJECT 25

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Enhancing capacity of local communities in Laikipia County, Kenya: increasing preparedness and	Extreme weather events such as droughts, heavy rainfall and flooding - resulting from climate change - could impact the project by preventing the	Moderate	N/A	Include consideration of the impacts of climate-related extreme events in training and ensure	Work with local authorities on early warning systems to have as much advanced notice as

response to emerging infectious diseases in parallel with preservation of biodiversity	project team from conducting the research and analysis and meeting with participants of the study.			flexibility and alternatives are available.	possible to anticipate and adapt to challenges in transportation and accessibility of health facilities for both patient care and training.
	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	Build awareness of causes and consequences of climate change and land use Provide scientific evidence for revising local management plans/policies

PROJECT 26: THE EFFECTS OF EXCESSIVE WATER USE AND AGRICULTURAL INTENSIFICATION ON ARAL SEA SHRINKAGE: SES DYNAMICS WITHIN THE SYR DARYA RIVER BASIN
TABLE AA. CRM SUMMARY TABLE FOR PROJECT 26

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
The Effects of Excessive Water Use and Agricultural Intensification on Aral Sea Shrinkage: SES Dynamics within the Syr Darya River Basin	Physical technologies, tools, and equipment may experience damage, loss, or premature deterioration due to increased heat or increased frequency and/or intensity of extreme climate-related events such as heat waves and flash floods.	Low	N/A	N/A	Strengthen available risk information through community mapping and open-source platforms. Enhance support for information-sharing systems and services, which may involve strengthening networks and promoting dialogue and cooperation among scientific communities and practitioners.

	In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	Build awareness of causes and consequences of climate change and land use. Provide scientific evidence for revising local management plans/policies.
	The potential for increased frequency and/or intensity of extreme climate-related events such as flooding to exacerbate soil erosion and its environmental degradation effect at sampling sites.	Moderate	An appropriate sampling procedure will be followed	Proper sampling design will be developed	N/A

PROJECT 27: RENEWABLE HYDROGEN GENERATION WITH CARBON RECYCLING (REHYCARE) FROM BIOGENIC RESIDUES OF BANGLADESH

TABLE BB. CRM SUMMARY TABLE FOR PROJECT 27

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Renewable Hydrogen Generation with Carbon Recycling (ReHyCaRe) from Biogenic Residues of Bangladesh	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides can damage equipment and inhibit facility access.	Moderate	N/A	Ensure equipment is located in an area safe from flooding and protected from extreme weather events. Provide education and training for staff to effectively respond to system disruptions or emergency events.	Promote best practices for mitigating GHG emissions amongst feedstock supply owners/farmers. Policy recommendations should include consideration of GHG emissions reduction in feedstock supply.
	Increased temperatures as well as increased frequency, duration, and/or intensity of extreme climate-related events such as storms, floods, droughts, and landslides can impact the	Moderate	N/A	Build in options and contingencies for feedstock supply in the case of disruption from extreme weather events. Encourage feedstock supply owners/farmers to prepare for extreme weather events.	

	locations where manure will be acquired for feedstock supply.				
	Experiments will produce minimal amounts of methane and carbon dioxide, not exceeding 400 kg CO2 equivalent over the duration of the project.	Low	The project will generate scientific data on possible recycling of CO2 in biogas through catalytic reforming leading to hydrogen generation. Hydrogen does not produce any GHG upon combustion and hence expected to provide a means to shift from fossil-based energy mix to a climate friendly energy mix in the future.	N/A	N/A

PROJECT 28: WATER HARVESTING AT COMMUNITY LEVEL FOR ENHANCED ACCESS TO GROUND WATER
TABLE CC. CRM SUMMARY TABLE FOR PROJECT 28

Defined or Anticipated Project Elements	Climate Risks	Risk Rating	How Risks are Addressed at Project Level	Further Analysis and Actions for Activity Design/ Implementation	Opportunities to Strengthen Climate Resilience
Water Harvesting at Community Level for Enhanced Access to Ground Water	Increased damage to water supply and sanitation systems, including collection, treatment, and distribution systems, due to flooding or increased intensity of precipitation.	Low	The area selected for this project is not in a highwater table.	N/A	Results from this research will generate data modeling to improve risk management for water systems.

In-person trainings, meetings, events, and capacity building activities may result in increased exposure or vulnerability to climate-related risks.	Low	N/A	N/A	N/A
Climate change can impact the seasonal variation of precipitation, affecting the rate of groundwater recharge and impacting research results.	Moderate	Analysis of groundwater recharge rates is explicit in project design.	Training for farmers must include measurement of groundwater quantity and quality in the context of climate change.	<p>Ensure consideration of cumulative impacts of water withdrawal from groundwater resources, particularly if demand for agricultural irrigation increases.</p> <p>Ensure farmers and relevant stakeholders work together to avoid cumulative over-extraction of groundwater resources in the context of climate change.</p>
Increased competition for water for rural and urban needs due to drought and water shortages	Moderate	N/A	Include consideration of increased competition over resources in analysis.	Consider the indirect social impacts of water shortages and work with stakeholders to plan ahead and manage these impacts.
Contaminated groundwater through boreholes and unprotected wells due to flooding	Low	Groundwater quality will be monitored every week	N/A	N/A